VIRGINIA PRODUCTIVITY CENTER

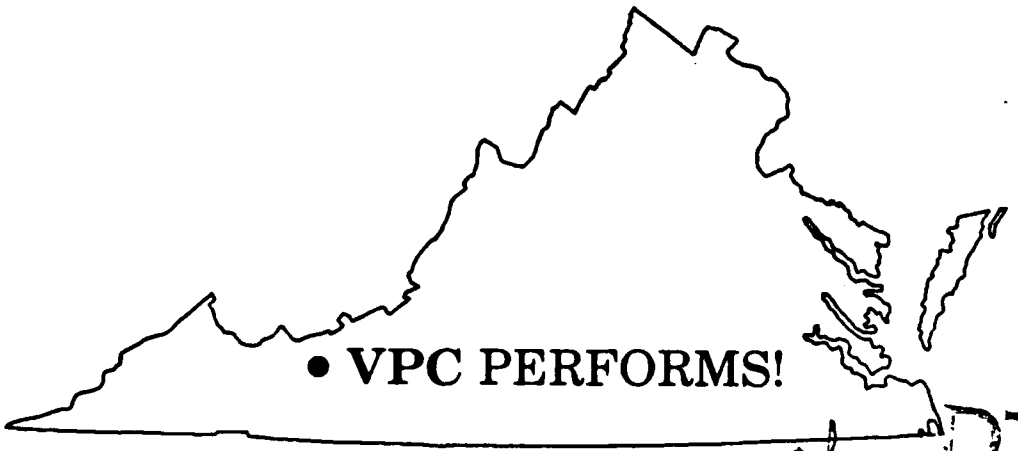
The Study of

Productivity Measurement

and Incentive Methodology

(Phase III - Paper Test)

Volume III



Virginia Polytechnic Institute
and State University

Blacksburg, Virginia 24061

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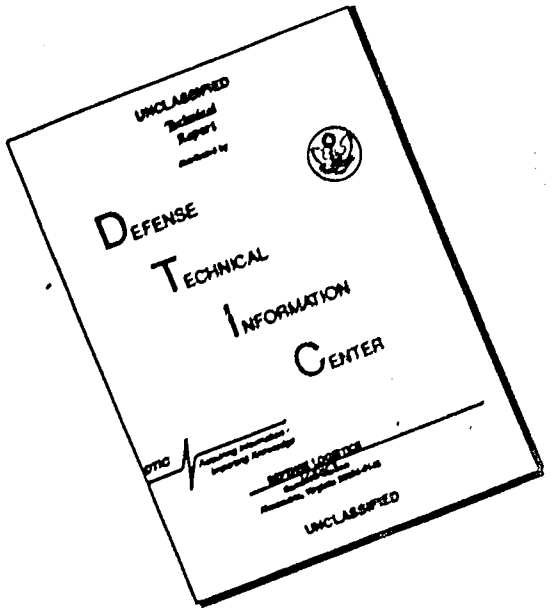

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The Study of
Productivity Measurement
and Incentive Methodology
(Phase III - Paper Test)
Volume III

FINAL REPORT

March, 1986

Defense Supply Service - Washington

Contract MDA 903-85-C-0237

VIRGINIA PRODUCTIVITY CENTER

VPI & STATE UNIVERSITY

Blacksburg, VA 24061

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SECURITY CLASSIFICATION OF THIS PAGE

ADA178398

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17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB. GR.	
			PRODUCTIVITY MEASUREMENT; PRODUCTIVITY EVALUATION; PRODUCTIVITY; MULTI-FACTOR PRODUCTIVITY MEASUREMENT; AUTOMATED COST BASELINE GENERATOR; DISCOUNTED CASH FLOW/SHARED SAVINGS MODEL; COST DEFINITION METHODOLOGY

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

THE OVERALL GOAL OF THE FIVE-PHASE STUDY WAS TO IDENTIFY AND DEVELOP "PRODUCTIVITY" MEASUREMENT AND METHODOLOGIES AND MODELS THAT WILL EFFECTIVELY INTEGRATE WITH GOVERNMENT TO CONTRACTOR INCENTIVE METHODOLOGIES. THE PHASE III REPORT CONSISTS OF THREE VOLUMES. VOLUME I CONSISTS OF A DETAILED SUMMARY OF THE PHASE III STUDY; VOLUME II, A DETAILED ANALYSIS OF THE MODELS TESTED; VOLUME III, FINAL REPORT BRIEFING AT DSMC.

IN PHASE III, THREE PRODUCTIVITY MEASUREMENT/EVALUATION MODELS WERE "PAPER" TESTED AGAINST A GENERIC SET OF CRITERIA TO DEPICT THE RELATIVE STRENGTHS AND WEAKNESSES OF EACH MODEL AS DIRECTLY RELATED TO THE INTENDED APPLICATION.

THE PAPER TEST REVEALED THE CRITICAL NEED TO DEVELOP A PRODUCTIVITY MEASUREMENT METHODOLOGY FOR DEFENSE CONTRACTORS THAT REPRESENTS A GRAND STRATEGY WHICH CAN BE TAILORED TO SUIT SPECIFIC SITUATIONS AND CIRCUMSTANCES.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL DAVID D. ACKER	22b. TELEPHONE NUMBER (Include Area Code) (703) 664-4795 22c. OFFICE SYMBOL DSMC-DRI-R

DD FORM 1473, 83 APR EDITION OF 1 JAN 73 IS OBSOLETE.

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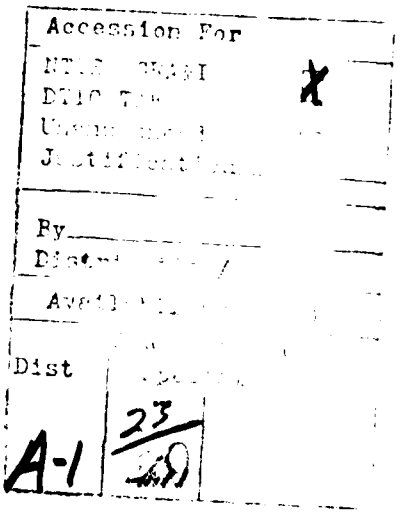
THE STUDY OF PRODUCTIVITY MEASUREMENT AND INCENTIVE METHODOLOGY (Phase III - Paper Test)



FINAL REPORT

14 March 1986

Contract MDA 903-85-C-0237
Defense Supply Service - Washington

Contract No. N00039-84-C-0346
VPI and State University

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Chell A. Roberts (Research Associate)
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Ray Thornton, Productivity Measurement Staff
Len Thorpe, Manager Productivity Measurement

Price Waterhouse
William T. Muir, Principal
Eugene J. Klein, Manager
Betty B. Thayer, Senior Consultant

Westinghouse Electric Corporation
Defense Group, Manufacturing Systems and Technology Center
Richard L. Engwall, Manager Systems Planning Analysis, and Assurance

Maryland Center for Productivity and Quality of Working Life
University of Maryland
Thomas C. Tuttle, Director

VOLUME III

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VIII.A.1 - Introductory Comments/Executive Summary

The Study of Productivity Measurement and Incentive Methodology

(Phase III Paper Test)

Final Presentation

17 January 1986

Fort Belvoir, Virginia

ITEM 2

FINAL AGENDA
FOR
FINAL PRESENTATION

17 January 1985
Fort Belvoir, VA

0900	Introduction(s)	Mr. David Acker (TCO)
0920	Introduction, Review Agenda, and Executive Summary	D. Scott Sink (PI)
	Paper Tests:	
1000	LTV Integrated Approach	S.Dhir
	VPC Evaluation	Sink
1200	LUNCH	
1330	CDEF:	
	Price Waterhouse	Thayer/Cline
	LTV/VAPD	Dhir
1415	MFPMM:	
	VPC	Sink/Roberts
	LTV/VAPD	Dhir/Thorpe
1500	BREAK	
1515	DCF/LMI/Westinghouse	
	Westinghouse	Engvall/_____
	LTV/VAPD	Thornton/Dhir
	VPC	Agee
1600	Summary/Conclusions/ Recommendations	Sink/Agee
1615	Q&A's, Recommendations from Advisory Board, Next Steps	
1630	Adjourn	

PHASE III PROJECT MANAGEMENT OBJECTIVES

010 -- DEVELOP DETAILED PLAN FOR PHASE III EXECUTION. HOLD INITIAL PLANNING SESSION.

011 -- SUBMIT SUMMARY REPORT FOR INITIAL PLANNING SESSION.

012 -- SUBMIT PROGRESS REPORTS ON A AS SCHEDULED/ NEEDED BASIS.

013 -- PROVIDE PROGRESS BRIEFINGS AS SCHEDULED/ REQUESTED.

014 -- EXECUTE PAPER TEST.

015 -- PROVIDE A DRAFT REPORT SUMMARIZING THE PAPER TEST 18 WEEKS AFTER CONTRACT APPROVAL.

016 -- PREPARE AND SUBMIT FINAL REPORT ON OR BEFORE 26TH WEEK AFTER CONTRACT APPROVAL. (NOTE: ONE MONTH EXTENTION HAS BEEN REQUESTED)

PHASE III

REPORTS AND PROJECT DELIVERABLES

- INITIAL PLANNING MEETING AND REPORT
  - JULY 26, 1985
  - MID AUGUST REPORT
- PLANS FOR PAPER TESTS
  - LTV PLANNING SESSION
  - LATE AUGUST
- PROGRESS REPORTS AND PRESENTATIONS
  - FIVE SCHEDULED
  - SCHEDULE TO BE DETERMINED
- DRAFT REPORT OF PAPER TESTS
  - LATE NOVEMBER
- FINAL REPORT OF PAPER TESTS
  - JANUARY 1986

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Major Findings

- None of the three models tested will accomplish all of the objectives desired by the Government or contractors.
- A methodology which integrates the use of these and perhaps other models is needed.
- Each of the three models has certain "soft spots" but all have excellent potential.
- The issue of translation, transfer, and effective implementation at other sites needs to be studied further.

Major Findings Cont'd

- **Final report shows how these three models, with derivations, can be combined into an effective approach.**
- **There is a need to differentiate between the notion of models versus methodologies.**
- **Major deficiencies in the software for the LMI/DCF/SSA model exist.**
- **The MFPMM must be modified rather significantly to work in the defense contractor environment.**

FIGURE III-1
Generic Productivity Management Methodology
as Related to Defense Industry

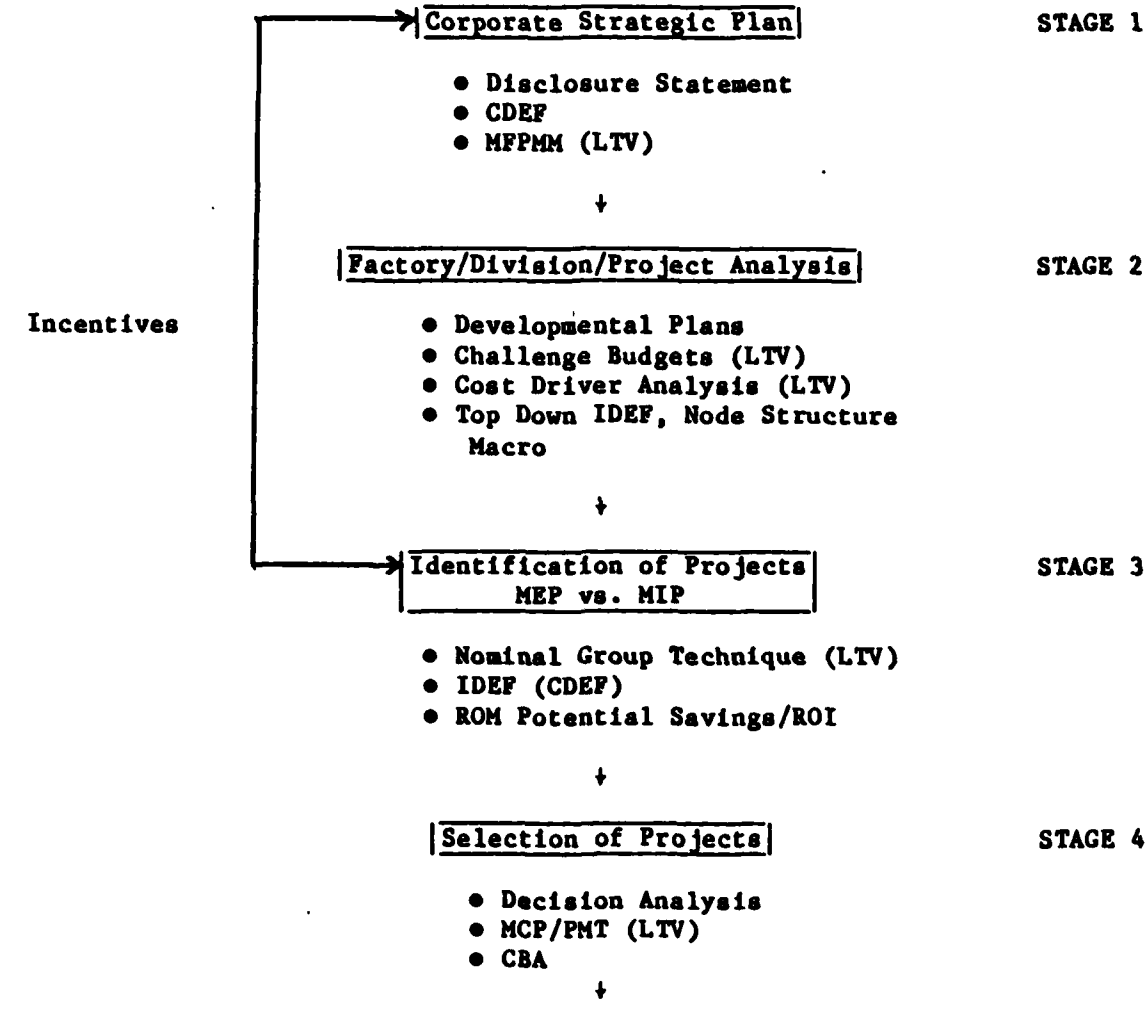
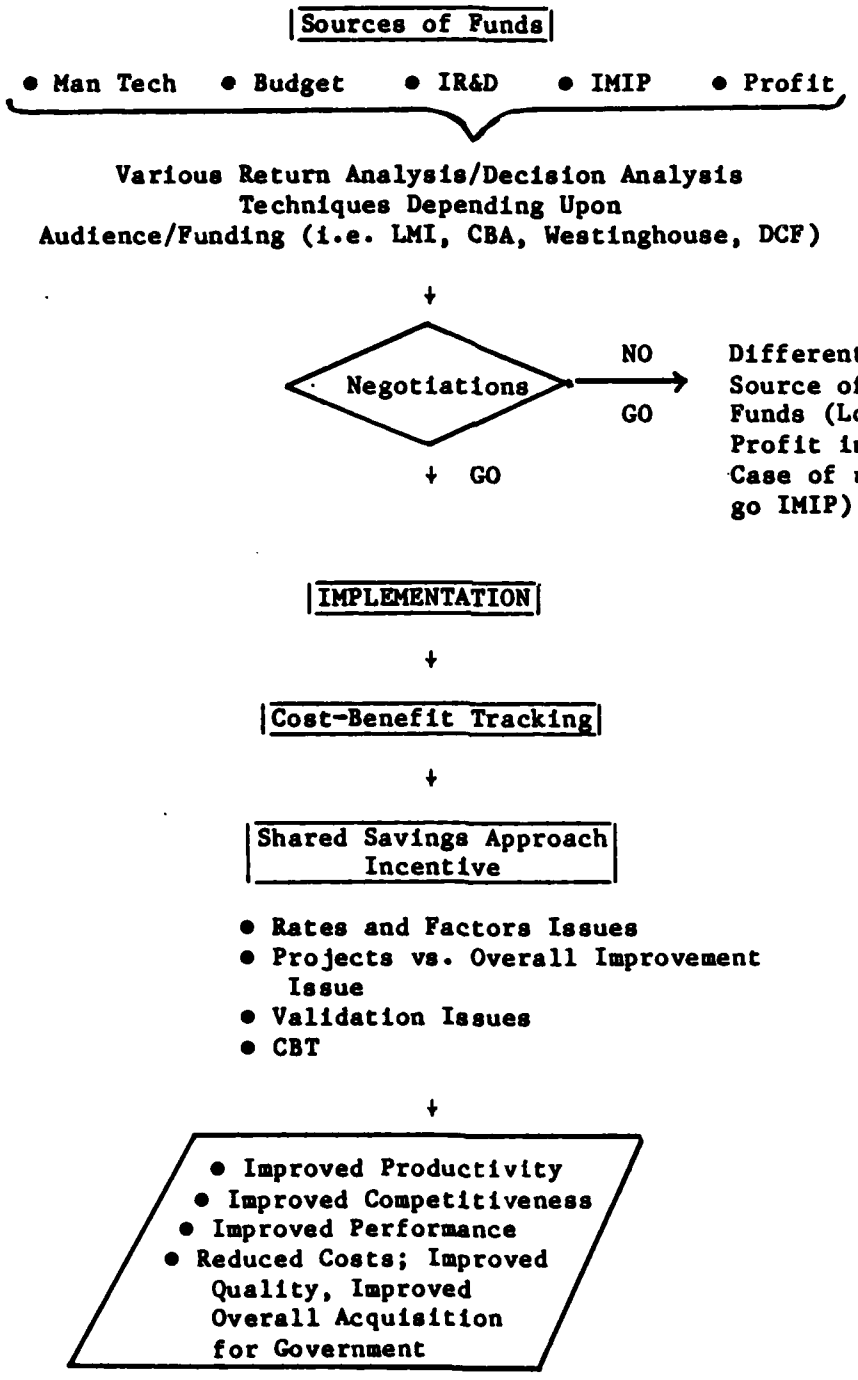


Figure III-1 (cont.)
Generic Productivity Management Methodology
As Related to Defense Industry



VIII.A.2 - LTV/VAPD Integrated Approach

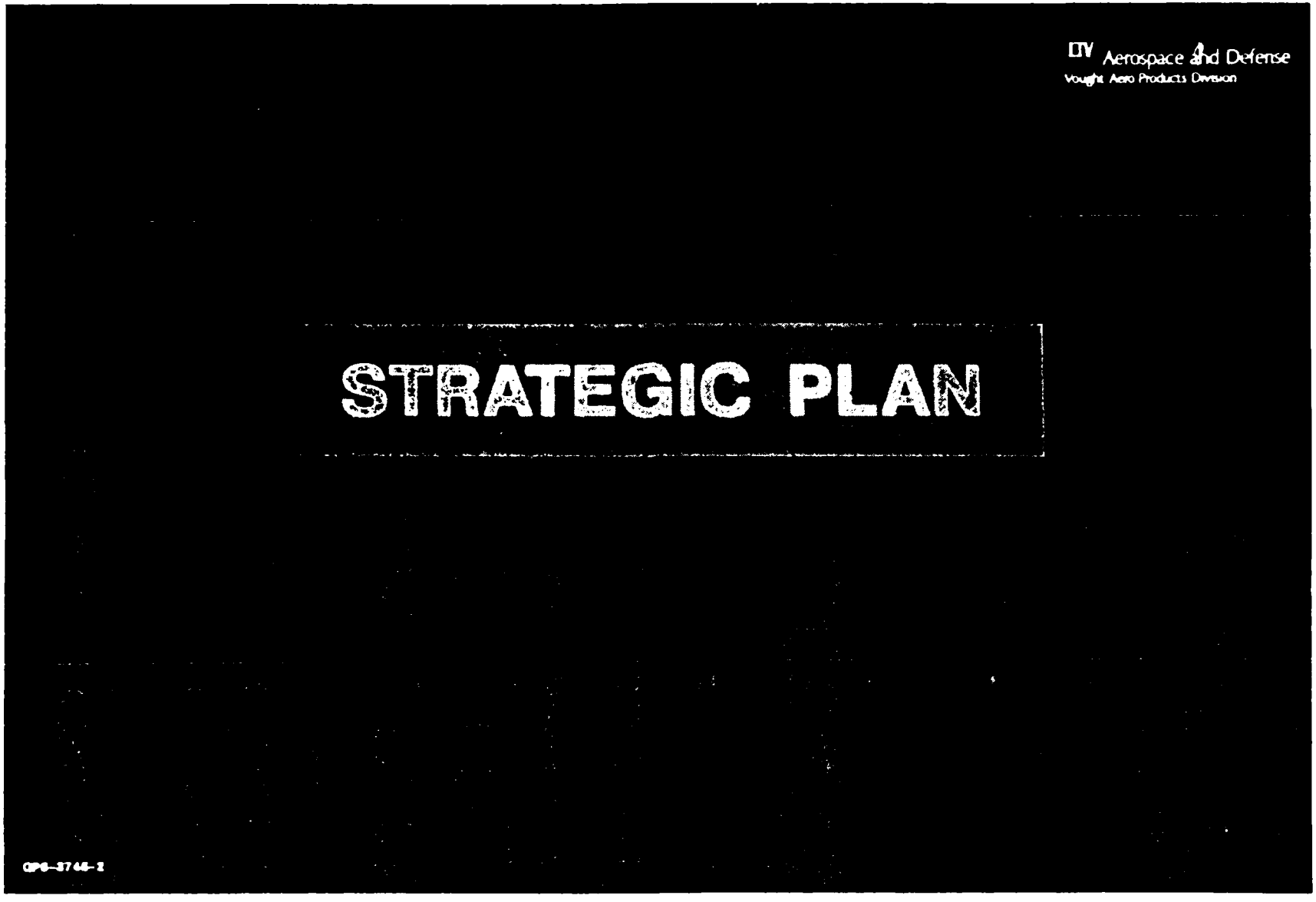
a. LTV Presentation

LTV Aerospace and Defense
Vought Aero Products Division

where we're headed

PRODUCTIVITY IMPROVEMENT THEME BUILT INTO

- STRATEGIC PLAN
- DEVELOPMENT PLAN
- BUDGETS
- OPERATIONS
- PROFITS
- PROPOSALS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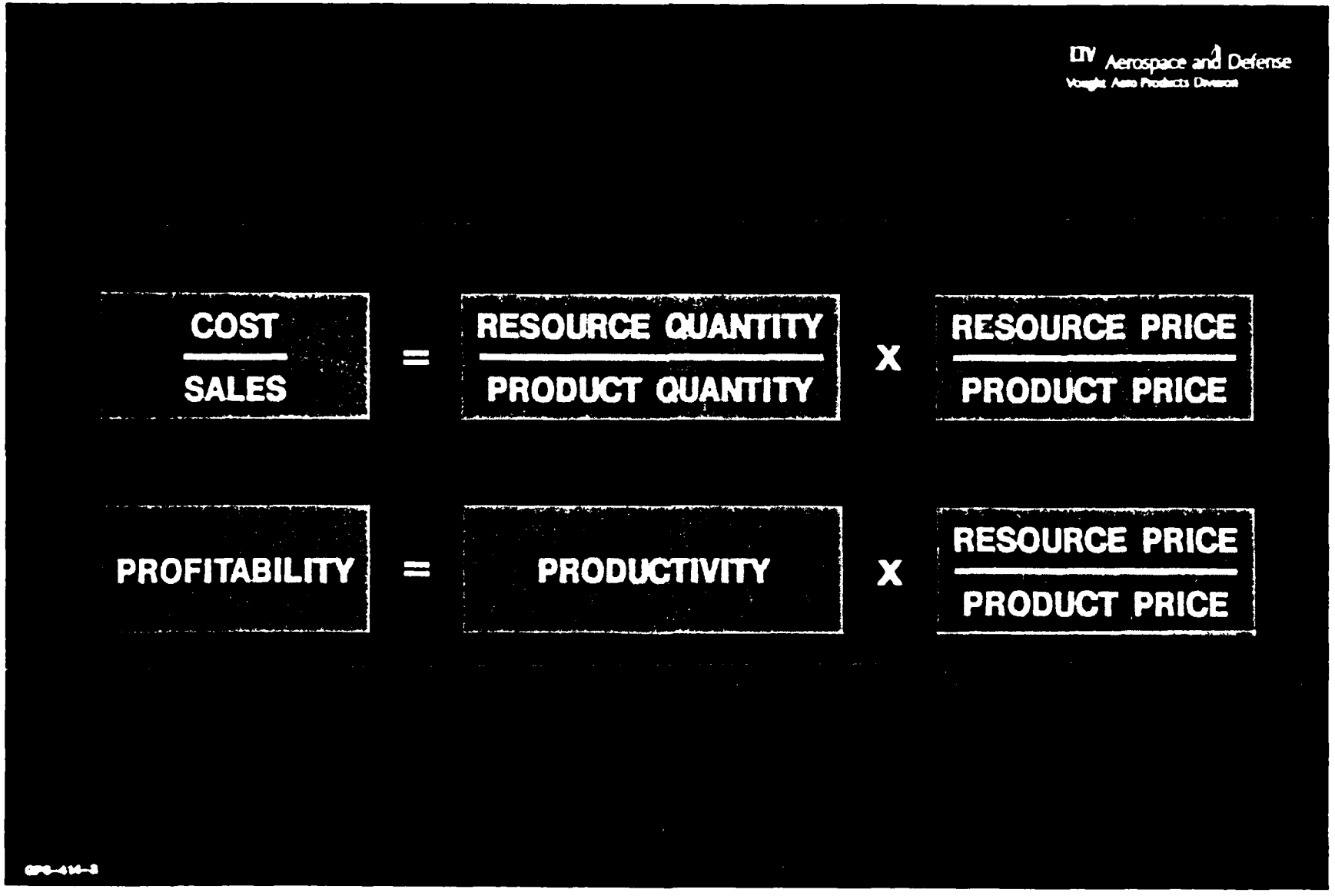
STRATEGIC PLAN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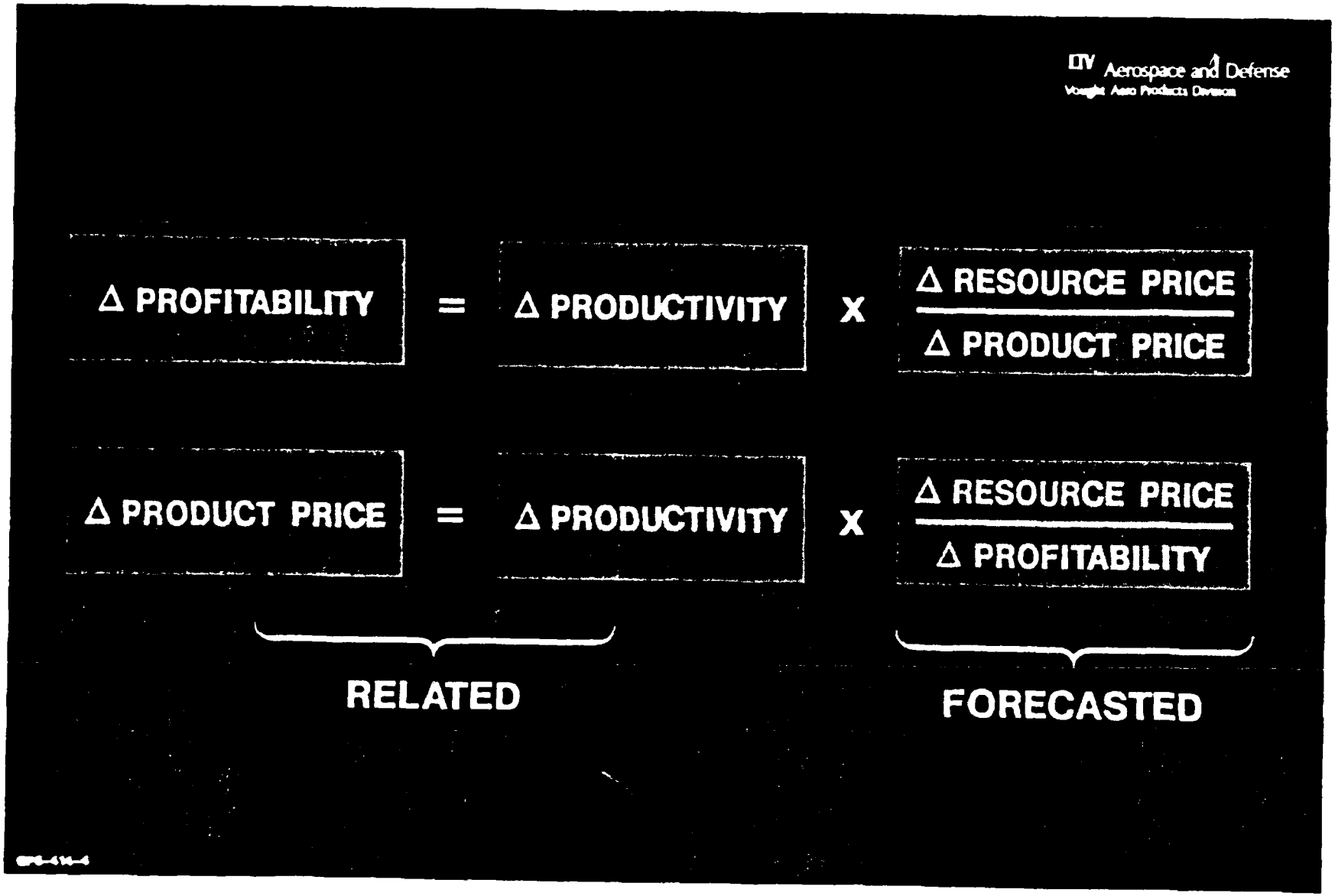
COST / SALES = RESOURCE QUANTITY / PRODUCT QUANTITY X RESOURCE PRICE / PRODUCT PRICE
PROFITABILITY = PRODUCTIVITY X RESOURCE PRICE / PRODUCT PRICE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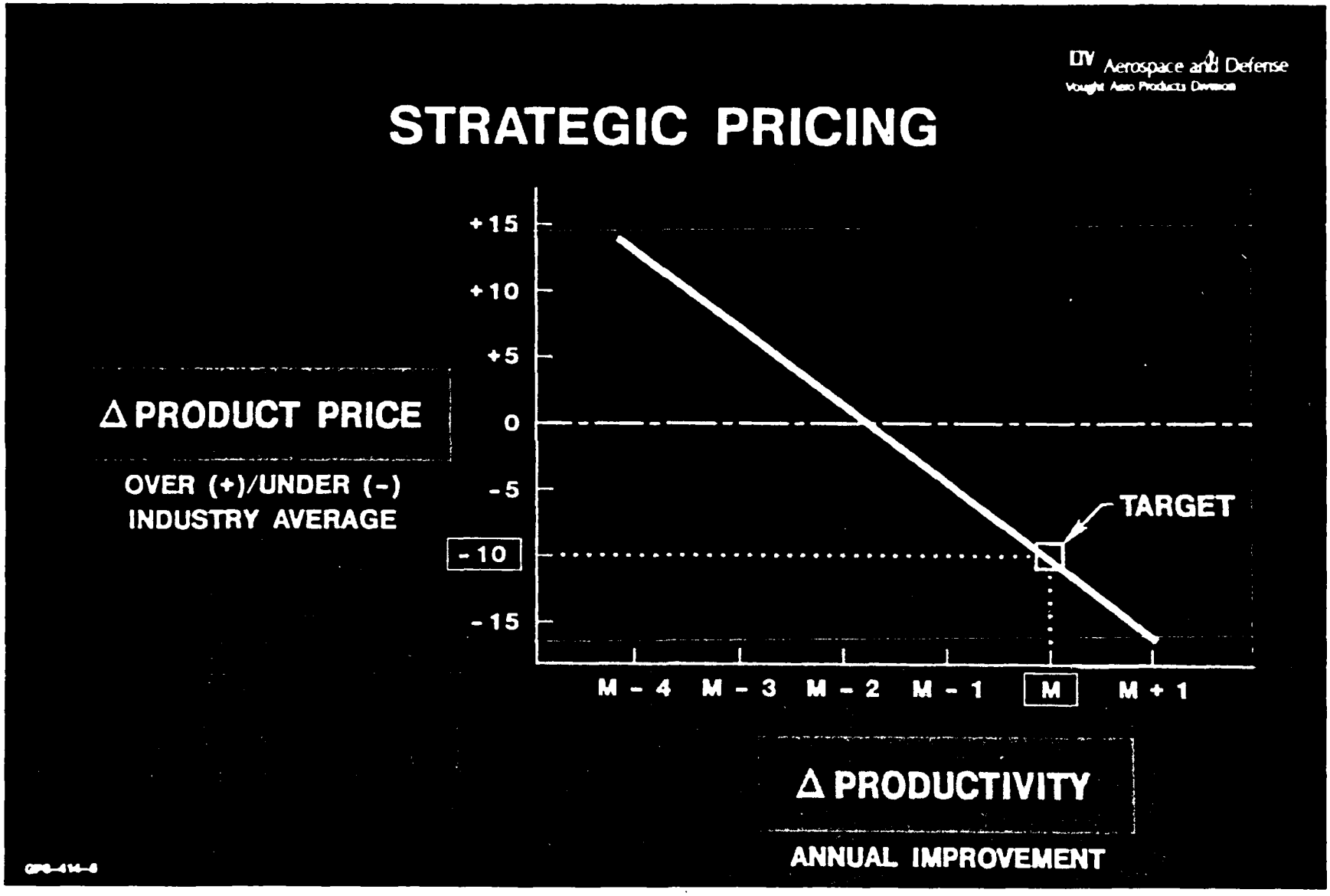
Δ PROFITABILITY = Δ PRODUCTIVITY X Δ RESOURCE PRICE / Δ PRODUCT PRICE
Δ PRODUCT PRICE = Δ PRODUCTIVITY X Δ RESOURCE PRICE / Δ PROFITABILITY
RELATED
FORECASTED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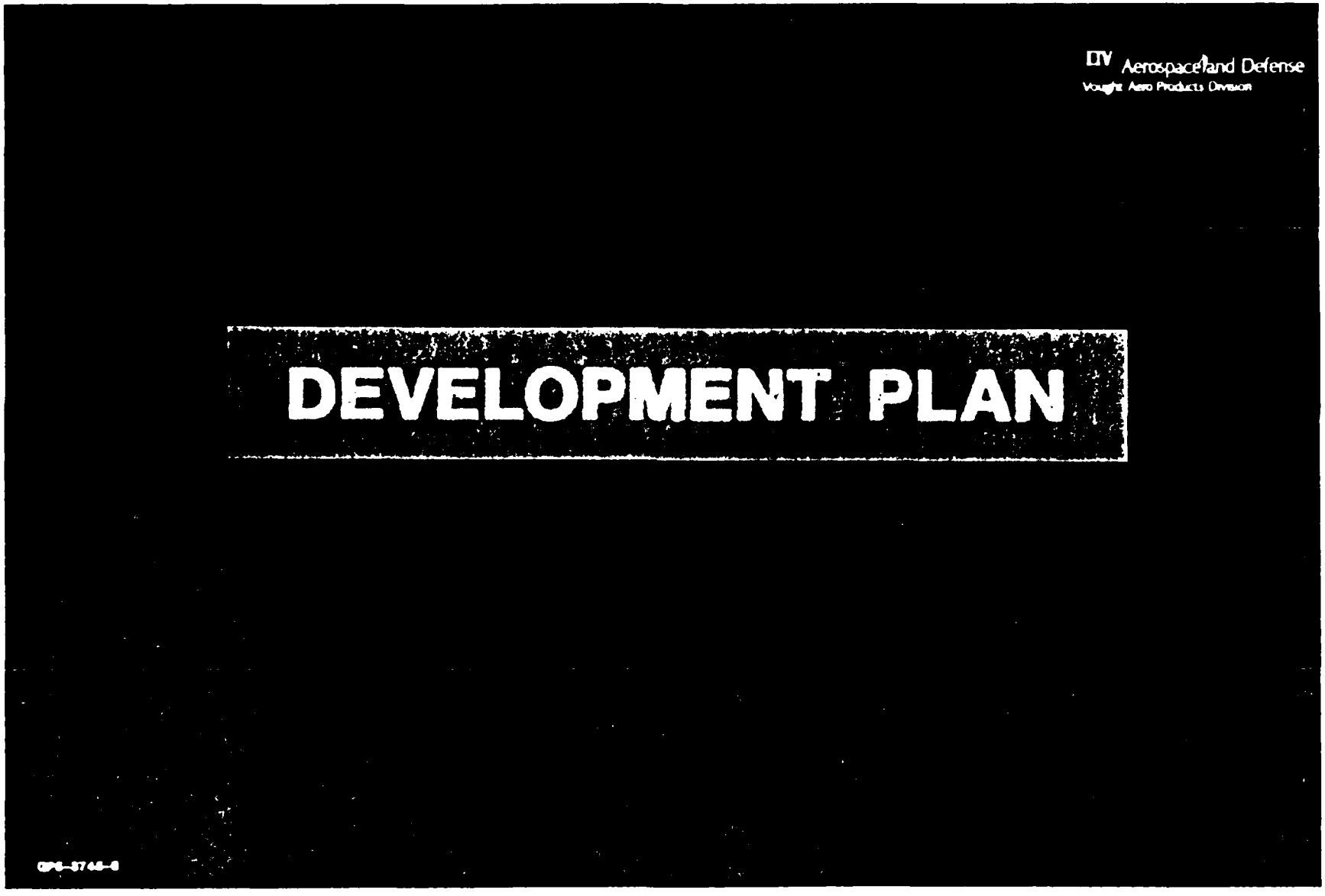
STRATEGIC PRICING
+15
+10
+5
0
-5
-10
-15
Δ PRODUCT PRICE
OVER (+)/UNDER (-)
INDUSTRY AVERAGE
TARGET
M - 4
M - 3
M - 2
M - 1
M
M + 1
Δ PRODUCTIVITY
ANNUAL IMPROVEMENT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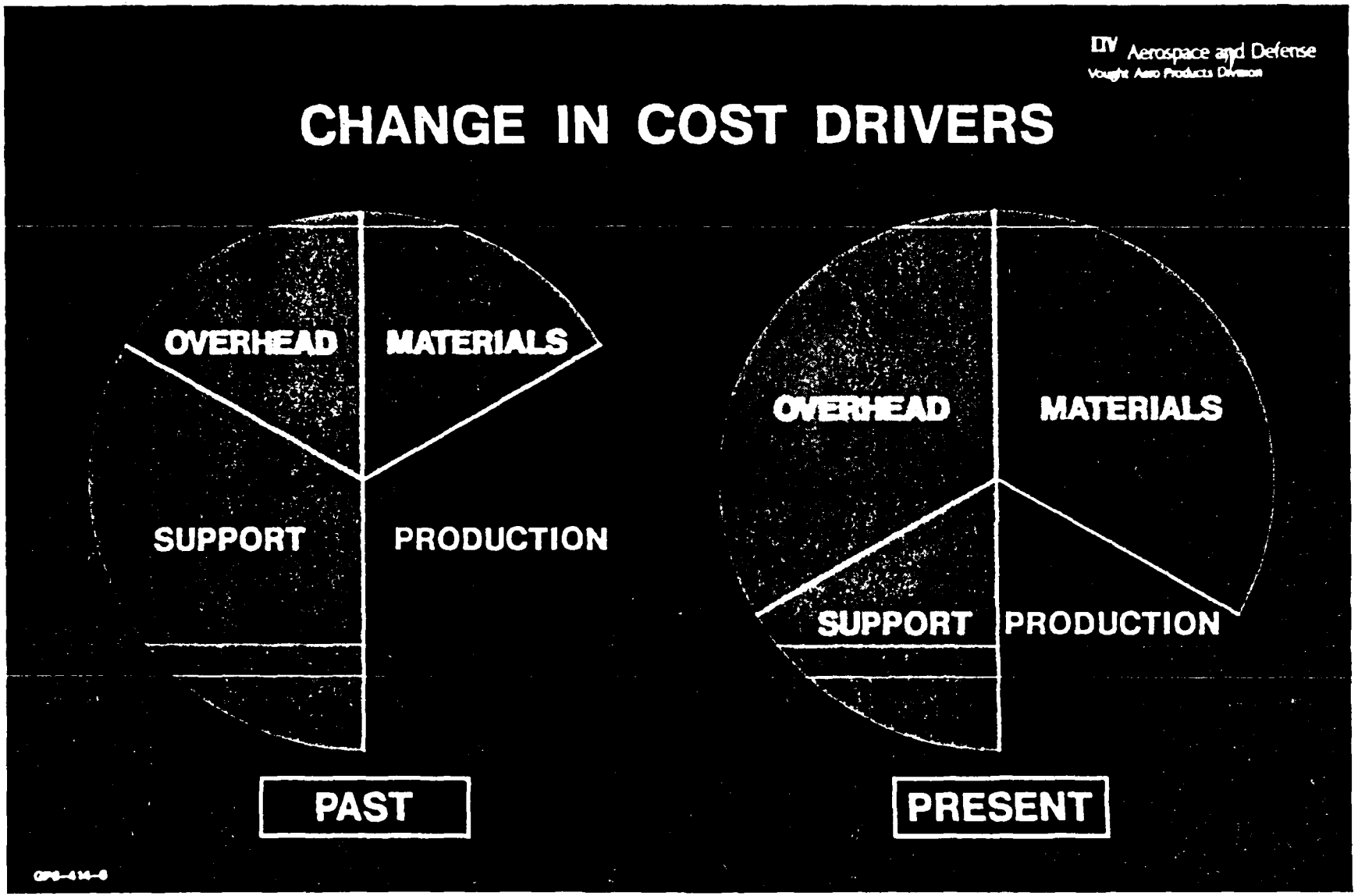
DEVELOPMENT PLAN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CHANGE IN COST DRIVERS
OVERHEAD
MATERIALS
SUPPORT
PRODUCTION
PAST
OVERHEAD
MATERIALS
SUPPORT
PRODUCTION
PRESENT

PROJECT SELECTION AND ANALYSIS

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HUMAN RESOURCES (HR)

EXAMPLE OF EMPLOYEE PARTICIPATION (NGT) RESULTS FOR ONE PROJECT

RANKING		PROJECT	VOTES	SCORE
EMPLOYEE	MANAGEMENT			
11	2	EMPLOYEE BADGE BASED AUTOMATION: • CLOSED CIRCUIT TV CHECK AT ENTRY AND EXIT • AUTOMATED ATTENDANCE - ELIMINATE TIME CARDS	7	31
ASSIGNED TO IMOD				

COST ANALYSIS FOR PROJECT: EMPLOYEE BADGE BASED AUTOMATION

FOCUS	AS-IS BASELINE		EXPECTED IMPROVEMENT		IMPLEMENTATION $M	
	HEADCOUNT	% OF HR COST	% OF BASELINE	% OF HR COST	CAPITAL	OTHER
• SECURITY	96	38	15.0	5.7		
• MAIL ROOM	18	7	6.0	0.7	4.2	2.0
• GENERAL	4000	1400	0.8	11.2		
• INTEREST	-	210	10.0	21.0		
				38.6		
				$ 4.8M		

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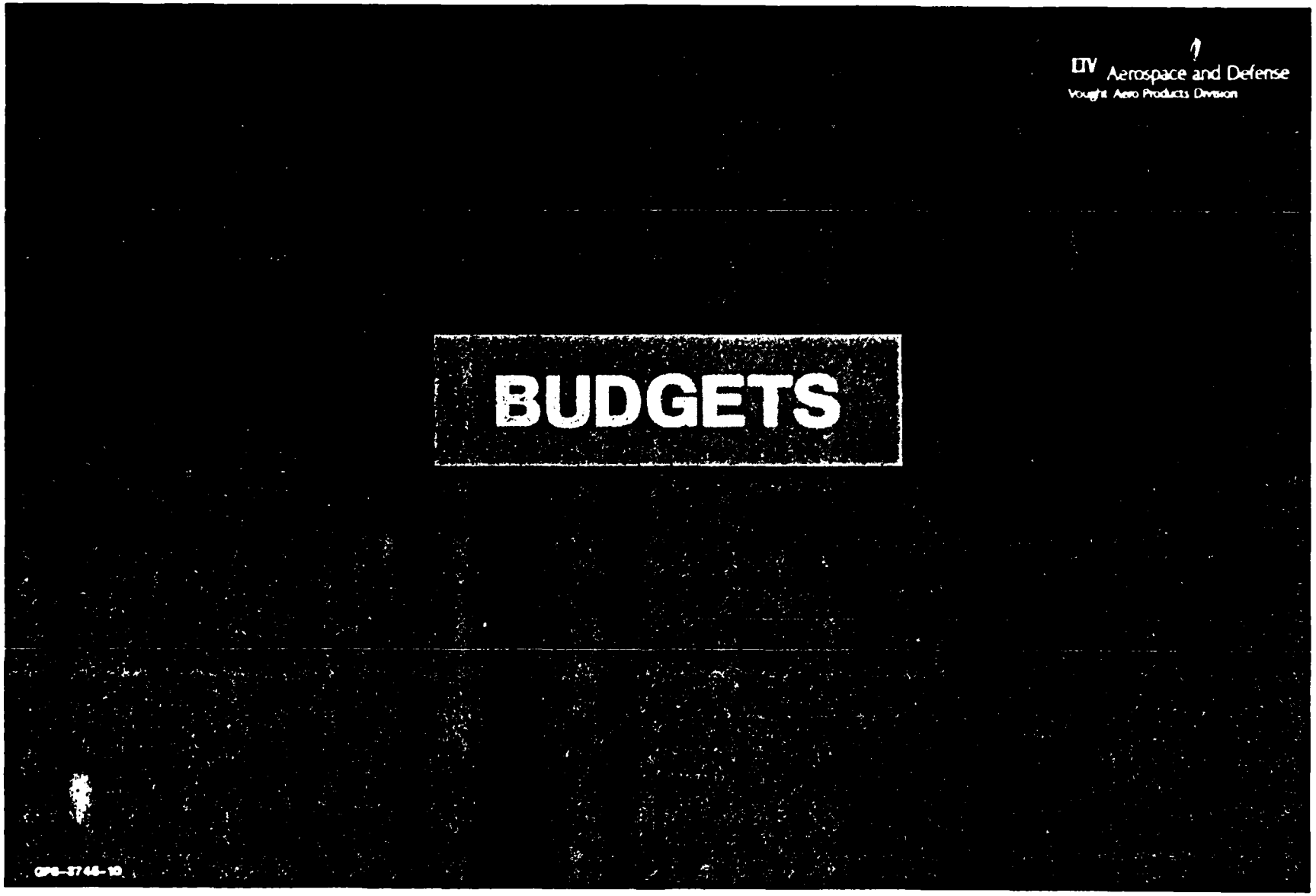
PRODUCTIVITY PROJECTS (PARTIAL LIST)

PROGRAM	FOCUS
• FLEXIBLE MANUFACTURING	PRODUCTION
• COMPUTER-AIDED DESIGN • COMPUTER-AIDED MANUFACTURING	ENGINEERING SUPPORT
• INVENTORY REDUCTION/JUST-IN-TIME	OVERHEAD
• AUTOMATED PROCUREMENT	MATERIALS
• OFFICE OF THE FUTURE	WHITE COLLAR
• EMPLOYEE BADGE BASED AUTOMATION (ENTRY, ATTENDANCE, PAYROLL)	SECURITY AND FINANCE
• ENERGY MANAGEMENT SYSTEMS	ENERGY
• ARTIFICIAL INTELLIGENCE BASED BIDS AND PROPOSALS	SALES
• AUTOMATED WAREHOUSING SYSTEMS	WAREHOUSING
• EMPLOYEE MOTIVATION AND GAINSHARING	GENERAL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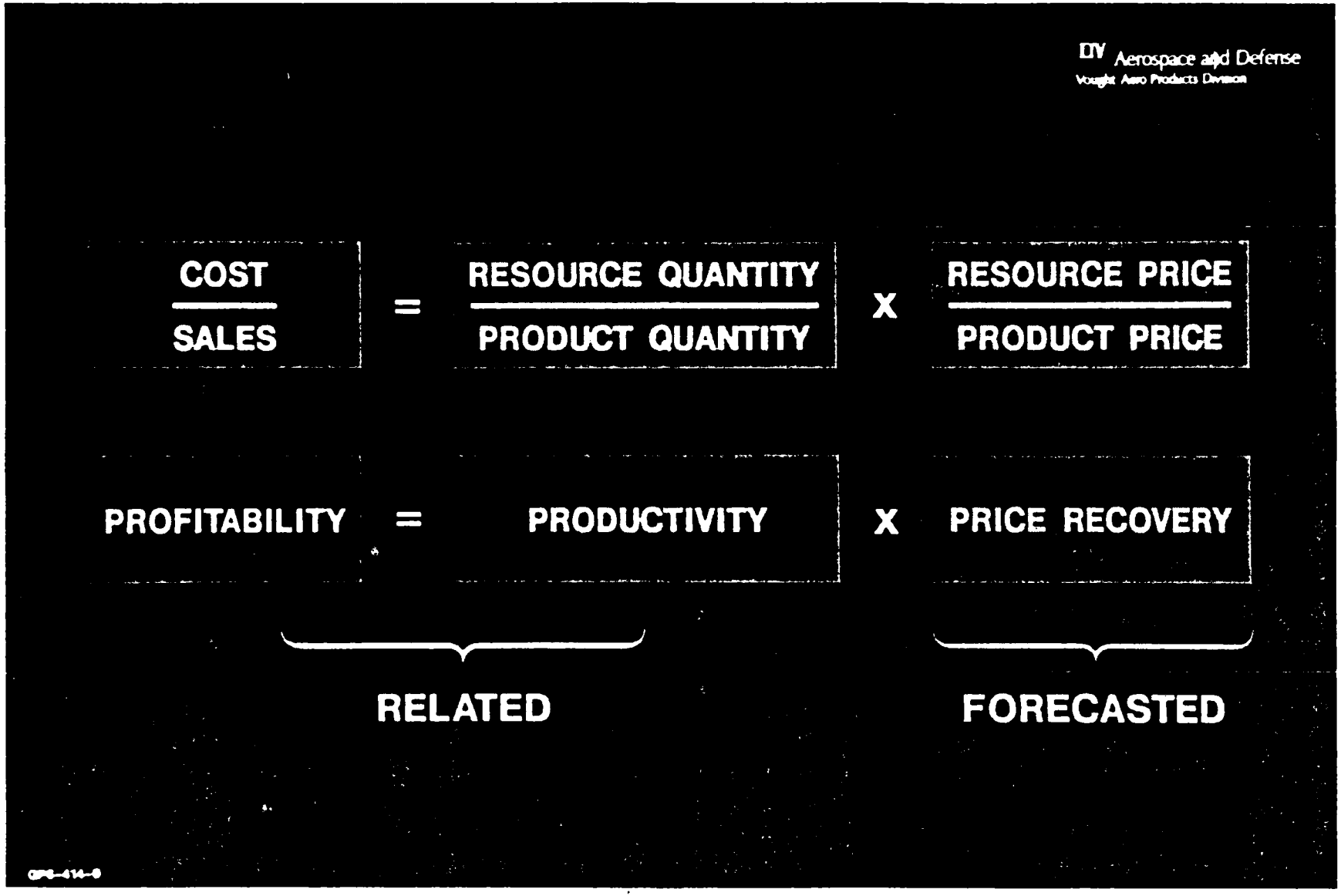
BUDGETS


DIV Aerospace and Defense
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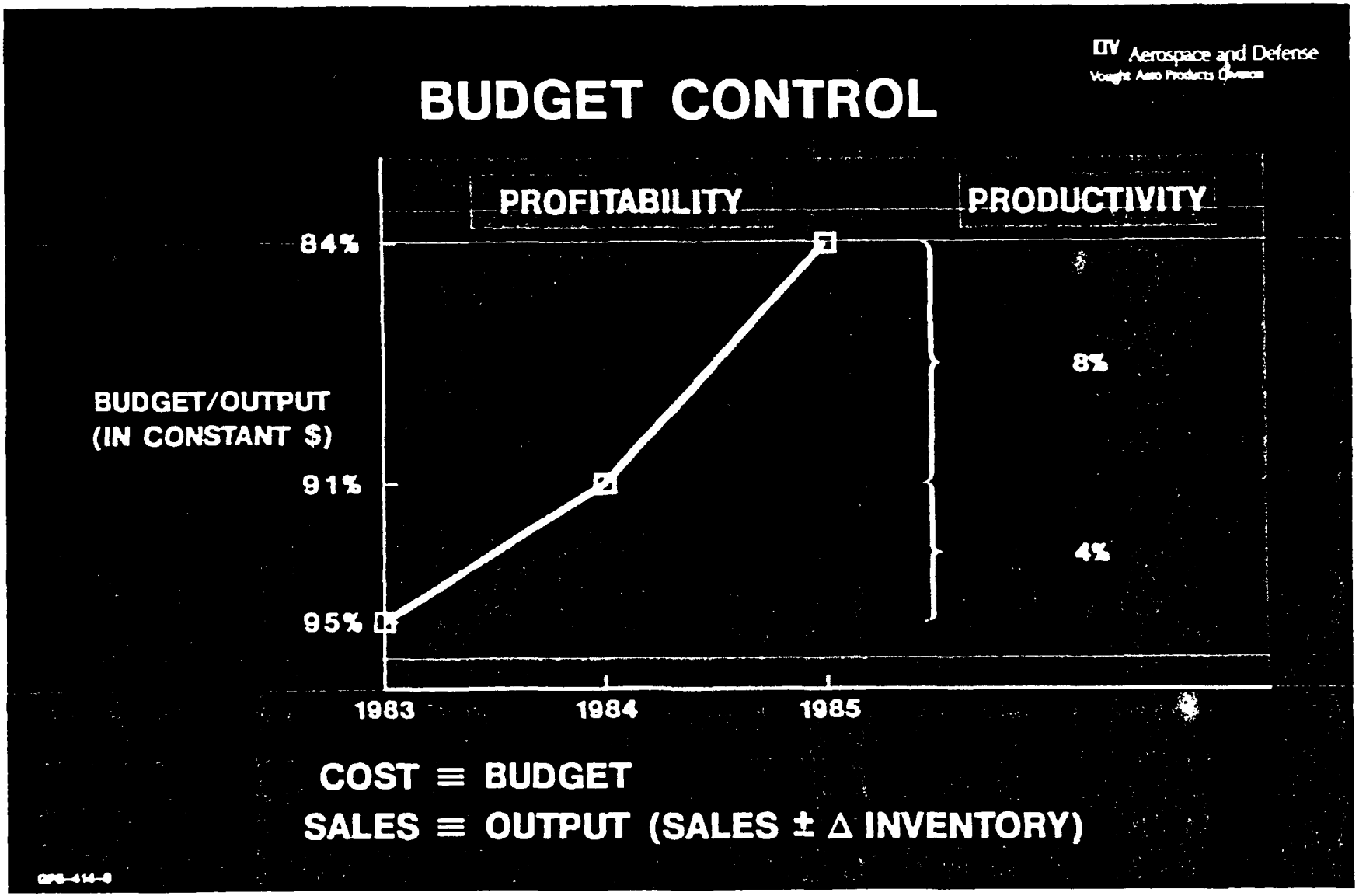
COST / SALES = RESOURCE QUANTITY / PRODUCT QUANTITY X RESOURCE PRICE / PRODUCT PRICE
PROFITABILITY = PRODUCTIVITY X PRICE RECOVERY
RELATED
FORECASTED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BUDGET CONTROL
PROFITABILITY
PRODUCTIVITY
84%
91%
95%
BUDGET/OUTPUT
(IN CONSTANT $)
8%
4%
1983
1984
1985
COST ≡ BUDGET
SALES ≡ OUTPUT (SALES ± Δ INVENTORY)

PROFITABILITY INCENTIVE

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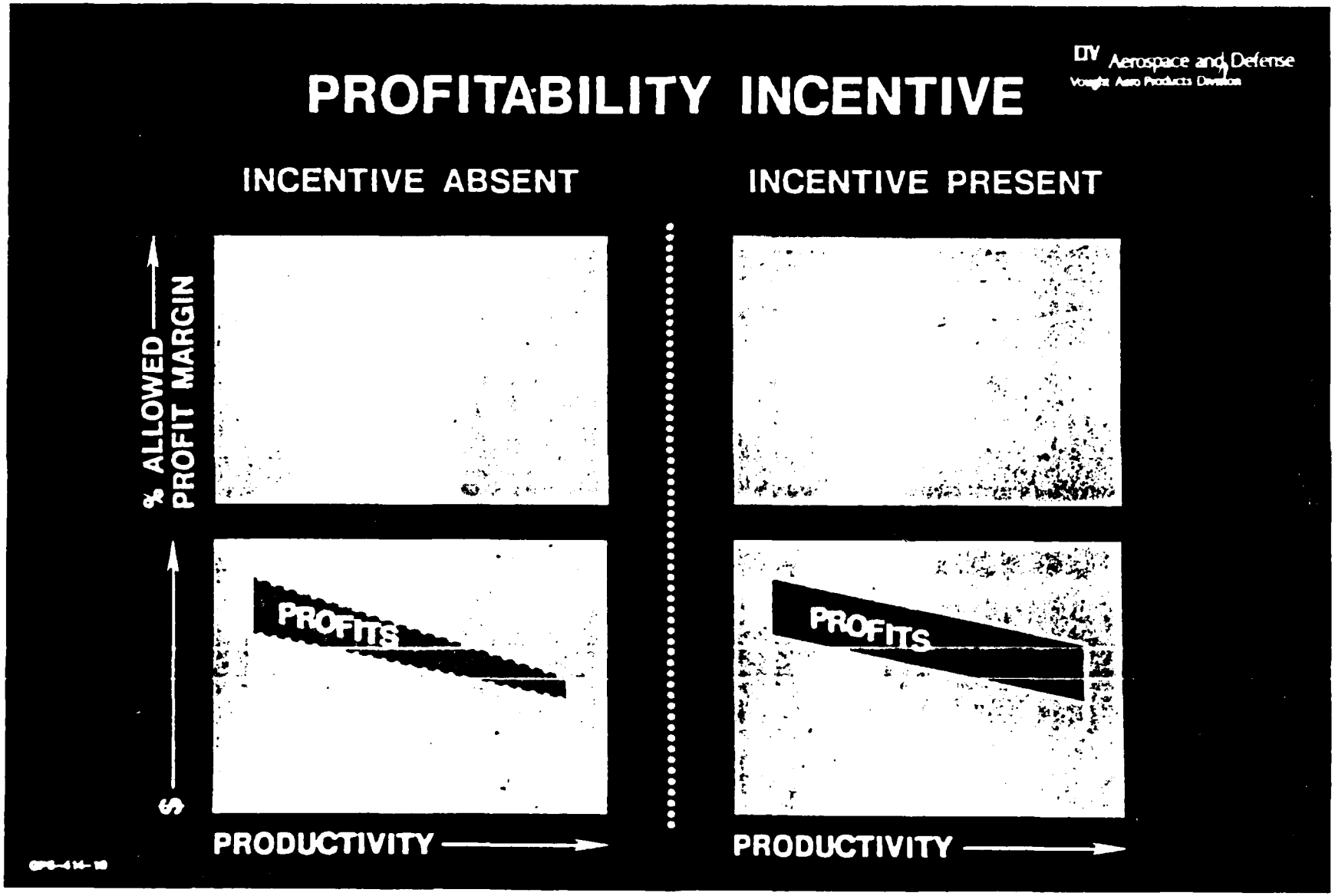

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PROFITABILITY INCENTIVE

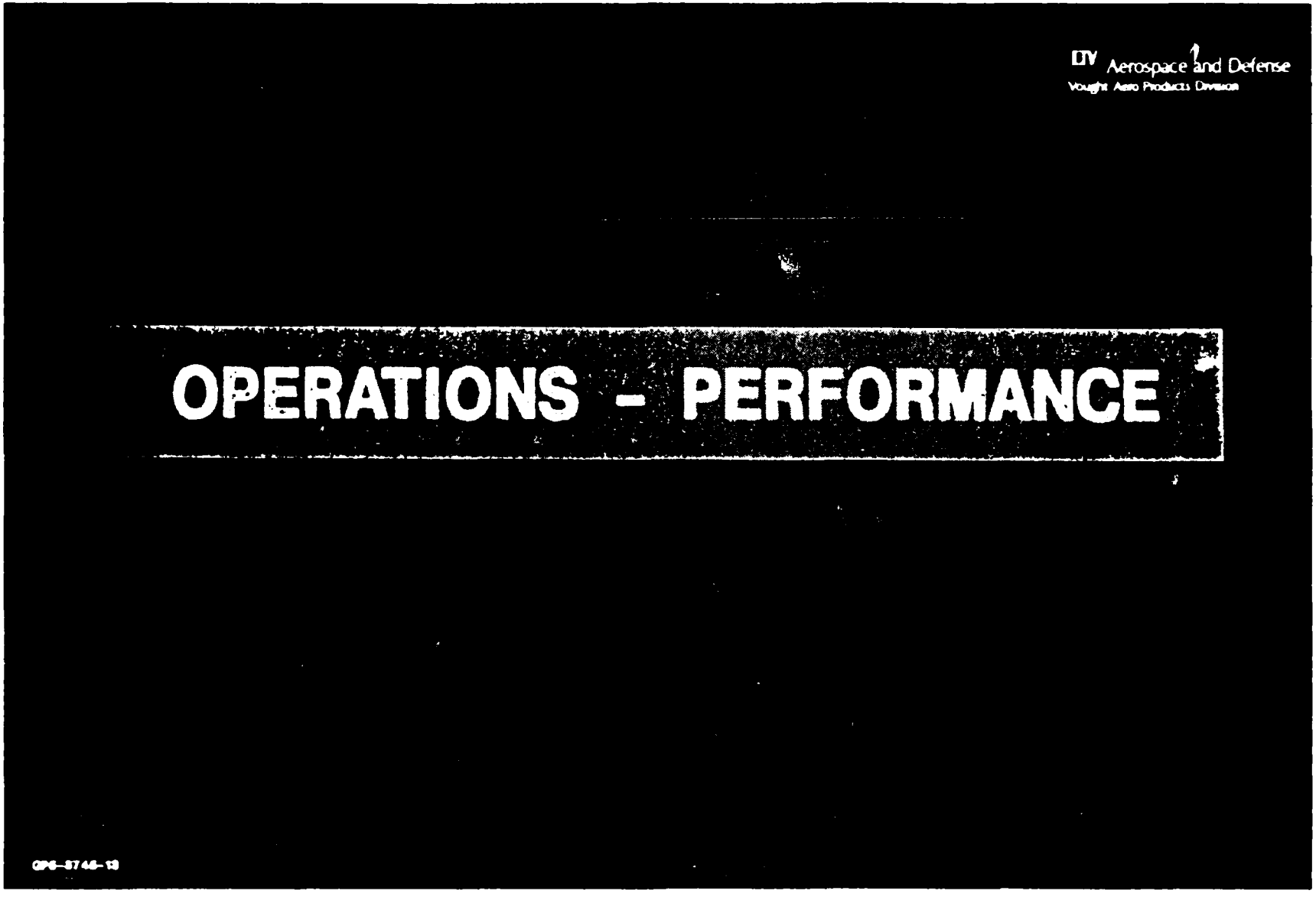
SIMPLE

UNIVERSAL

MACRO

MEASURABLE

AUDITABLE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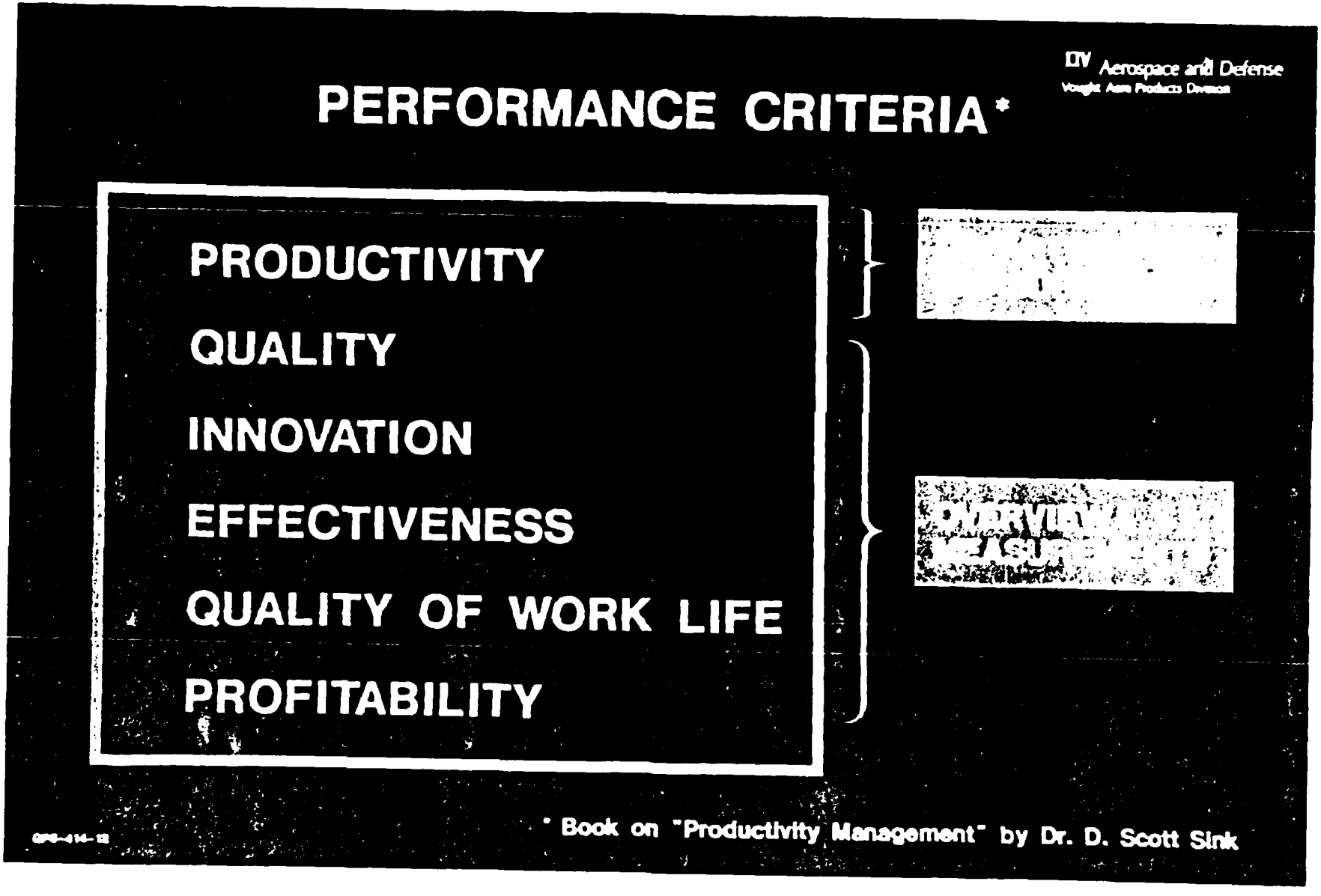
OPERATIONS - PERFORMANCE
OP6-8744-10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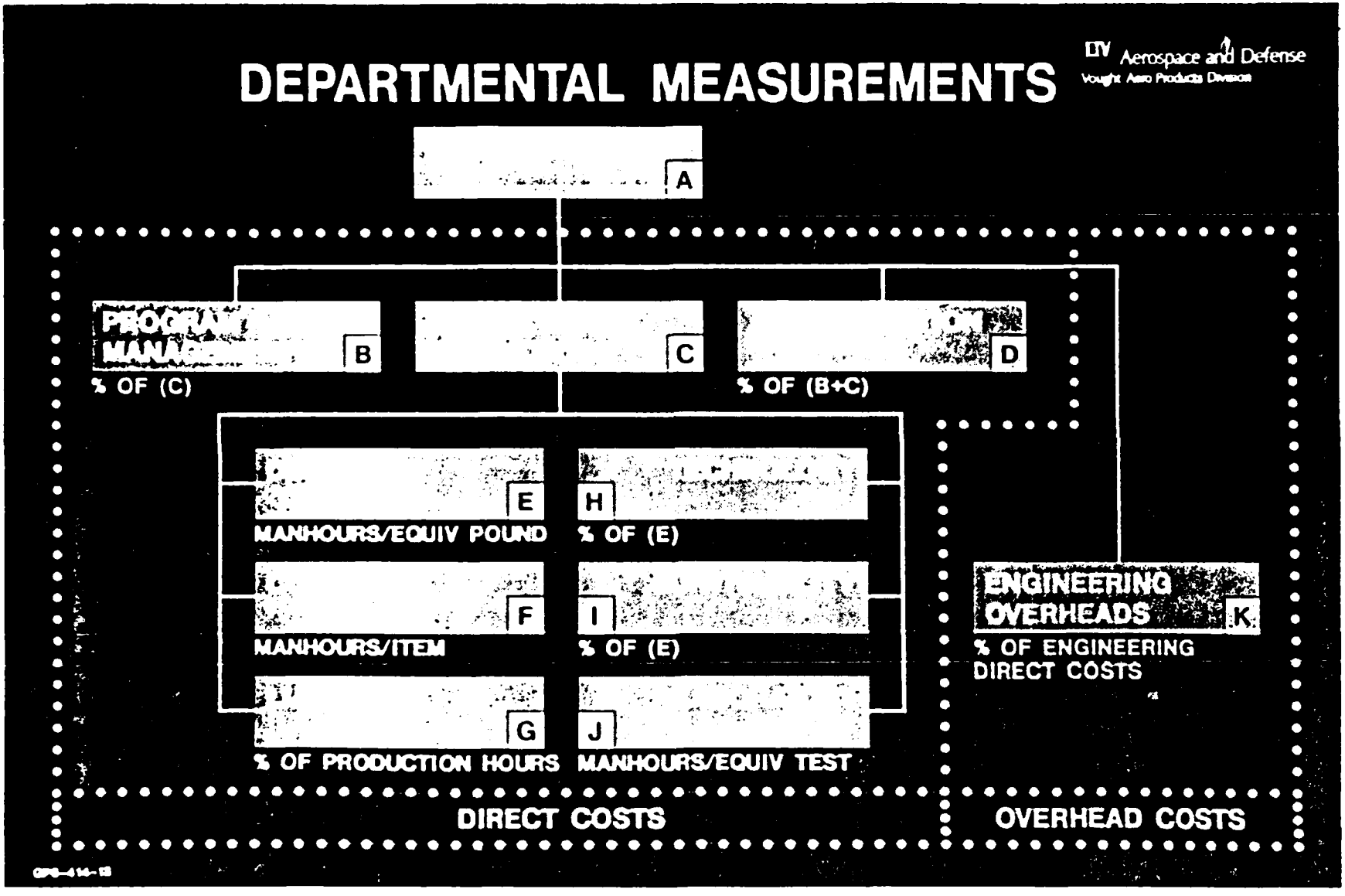
PERFORMANCE CRITERIA*
PRODUCTIVITY
QUALITY
INNOVATION
EFFECTIVENESS
QUALITY OF WORK LIFE
PROFITABILITY
* Book on "Productivity Management" by Dr. D. Scott Sink


DEPARTMENTAL MEASUREMENTS
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A
B
C
D
% OF (C)
% OF (B+C)
E
MANHOURS/EQUIV POUND
H
% OF (E)
F
MANHOURS/ITEM
I
% OF (E)
G
% OF PRODUCTION HOURS
J
MANHOURS/EQUIV TEST
ENGINEERING OVERHEADS
K
% OF ENGINEERING DIRECT COSTS
DIRECT COSTS
OVERHEAD COSTS

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OVERVIEW MEASUREMENTS

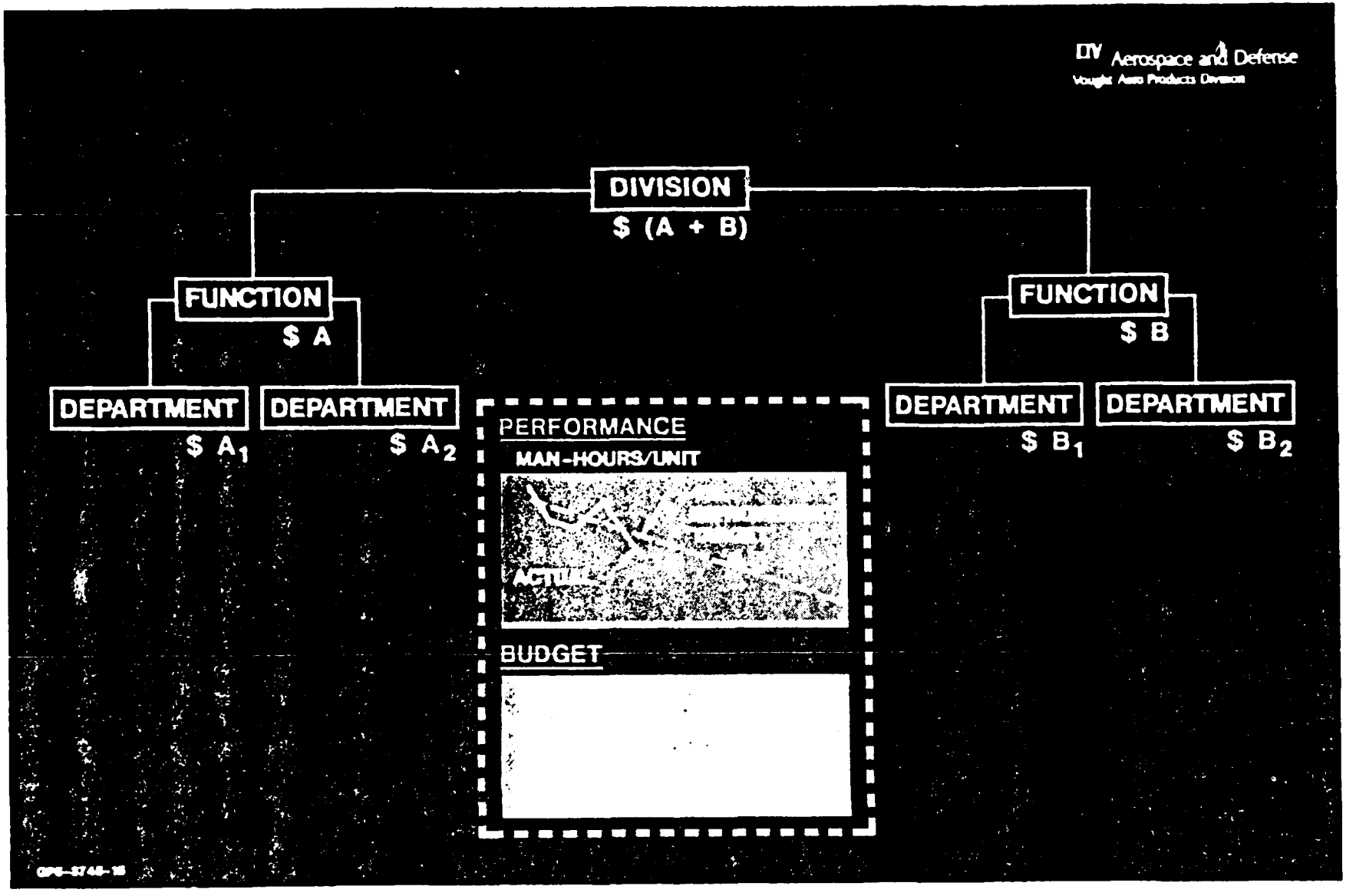
SALES FROM INHOUSE DEVELOPED PRODUCTS
R&D COSTS

R&D COSTS
TOTAL ENGINEERING COSTS

LABOR TURNOVER

TRAINING AND EDUCATION COSTS
ENGINEERING SALARY AND WAGES

ENGINEERING CHANGE TRAFFIC PER PART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DIVISION
$ (A + B)
FUNCTION
$ A
FUNCTION
$ B
DEPARTMENT
$ A1
DEPARTMENT
$ A2
DEPARTMENT
$ B1
DEPARTMENT
$ B2
PERFORMANCE
MAN-HOURS/UNIT
ACTUAL
BUDGET

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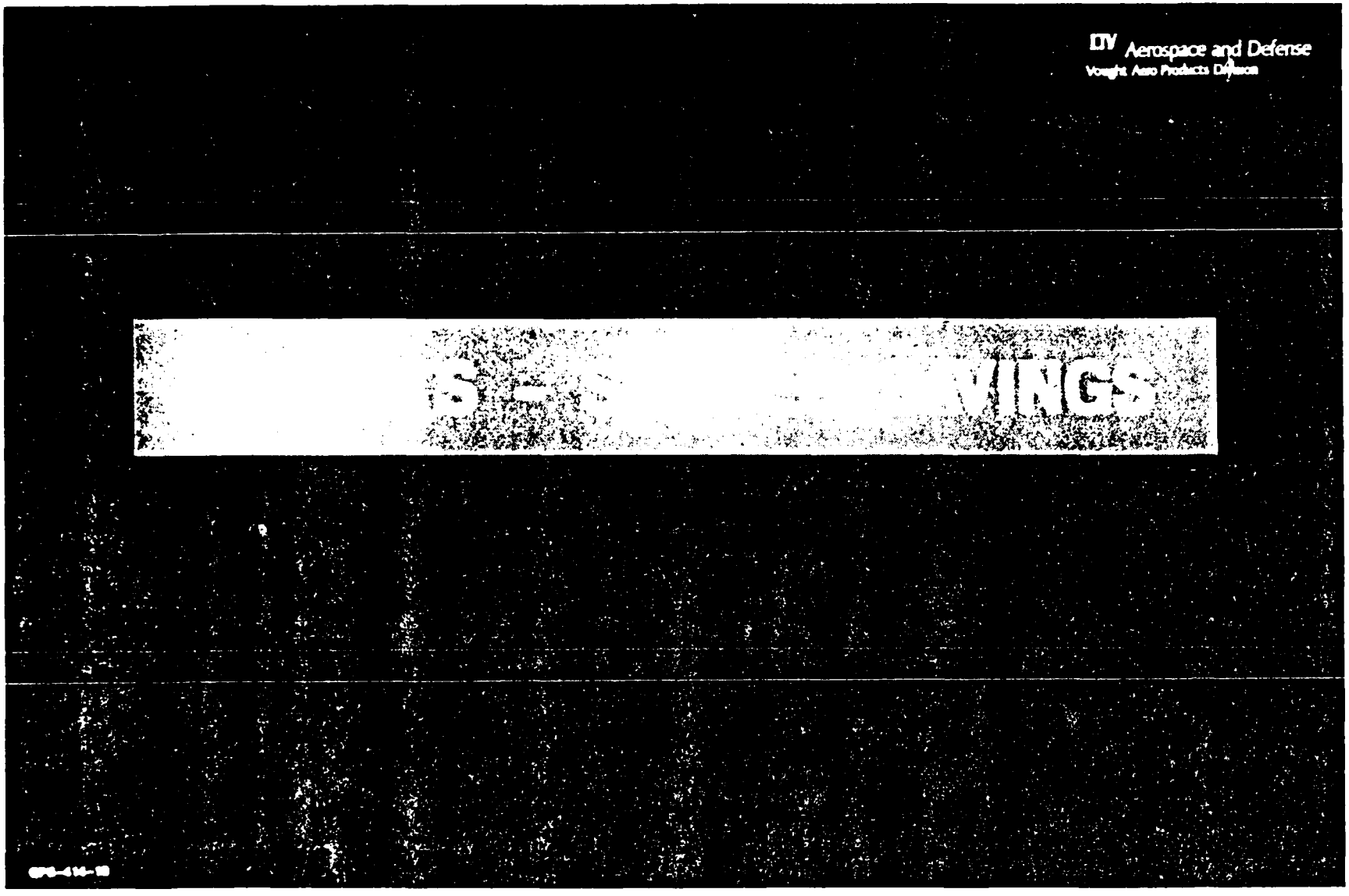
INTERNAL GAINSHARING

DEPARTMENTAL MEASUREMENTS ARE DIRECTLY RELATED TO BUDGETS

DEPARTMENTAL CONTRIBUTION TO COMPANY WIDE IMPROVEMENTS CAN BE ASSESSED

DEPARTMENTAL CONTRIBUTIONS ARE SUBJECT TO MEETING OVERVIEW PERFORMANCE

MEASUREMENT SYSTEM PROVIDES THE MEANS FOR INTERNAL GAINSHARING


DTV Aerospace and Defense
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WINGS

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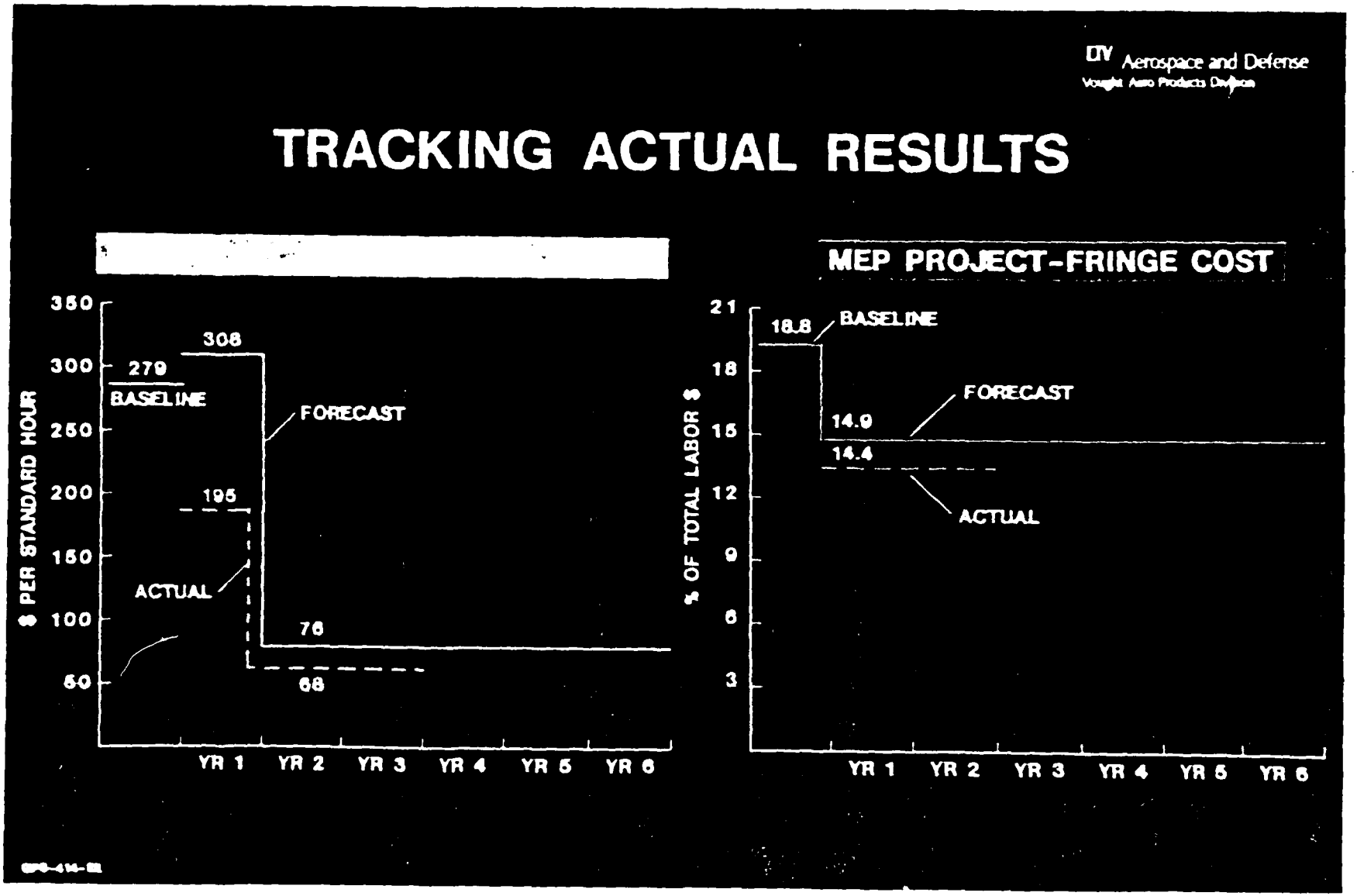
TWO TYPES OF IMIP PROJECTS

MODERNIZATION INVESTMENT (MIP)	MODERNIZATION EFFICIENCY (MEP)
• CAPITAL INTENSIVE	• NO SIGNIFICANT CAPITAL
• EQUIPMENT & FACILITIES	• MANAGEMENT & SYSTEMS
• RETURN-ON-INVESTMENT	• NEGOTIATED REWARDS
FOCUS: MANUFACTURING	FOCUS: OVERHEAD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TRACKING ACTUAL RESULTS
MEP PROJECT-FRINGE COST
$ PER STANDARD HOUR
350
300
250
200
150
100
50
308
279
BASELINE
FORECAST
195
ACTUAL
76
68
YR 1
YR 2
YR 3
YR 4
YR 5
YR 6
% OF TOTAL LABOR $
21
18
15
12
9
6
3
18.8
BASELINE
FORECAST
14.9
14.4
ACTUAL
YR 1
YR 2
YR 3
YR 4
YR 5
YR 6

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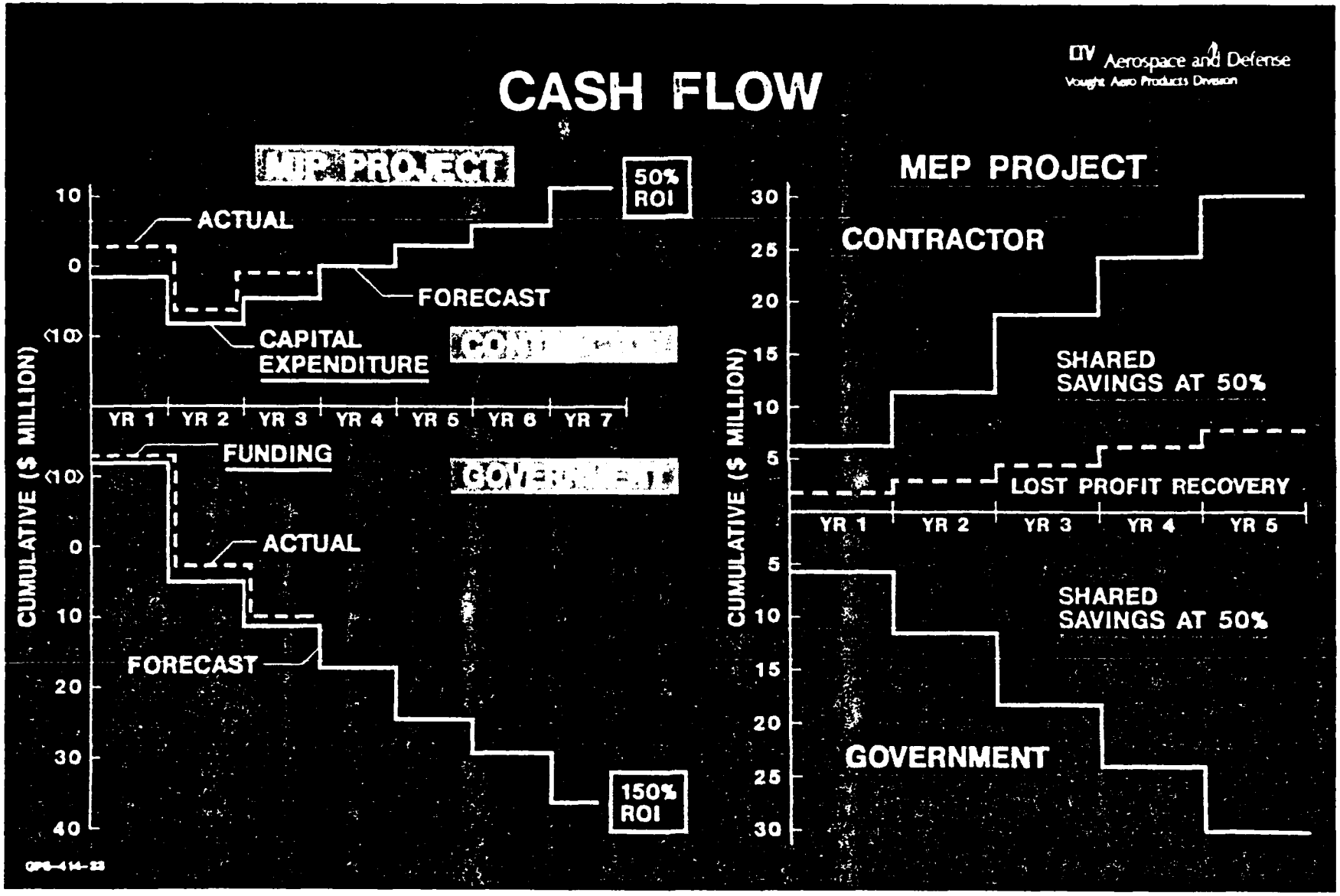
SHARED SAVINGS

		MEP PROJECT
FLEXIBLE MACHINING	PROJECT DESCRIPTION	FRINGE COST
$ COST OF AFFECTED PARTS / AS-IS STANDARD HOURS	1. DEFINE MEASUREMENT	FRINGE BENEFIT $ / LABOR $
$ 279 PER STD. HOUR	2. DEFINE BASELINE	18.8%
$ 195 PER STD. HOUR	3. MEASURE ACTUAL PERFORMANCE	14.4%
30%	4. DETERMINE IMPROVEMENT	4.4%
$ 35,000	5. CALCULATE INCREMENTAL SAVINGS PER % IMPROVEMENT	$2,700,000
30 X $35,000 = $1,050,000	6. ACTUAL SAVINGS DETERMINATION	4.4 X $2,700,000 = $12,000,000
0.50 X $1,050,000 = $525,000	7. SHARED SAVINGS	0.50 X $12,000,000 = $6,000,000
STANDARD HOURS	8. ALLOCATION BASE	LABOR COST
PROGRAM X Y Z STD. HRS. (000) 30 13 7 % ALLOCATION 61 26 13 $(000) SAVINGS 320 137 68	9. PROGRAM ALLOCATION	PROGRAM A B C D $(000) LABOR COST 3000 14000 25000 77000 % ALLOCATION 2.5 11.8 21 64.7 $(000) SAVINGS 150 710 1260 3880


CASH FLOW
LTV Aerospace and Defense
Vought Aero Products Division
MEP PROJECT
50% ROI
ACTUAL
FORECAST
CAPITAL EXPENDITURE
CONTRACTOR
FUNDING
GOVERNMENT
YR 1
YR 2
YR 3
YR 4
YR 5
YR 6
YR 7
CUMULATIVE ($ MILLION)
10
0
(10)
(10)
0
10
20
30
40
MEP PROJECT
CONTRACTOR
SHARED SAVINGS AT 50%
LOST PROFIT RECOVERY
YR 1
YR 2
YR 3
YR 4
YR 5
CUMULATIVE ($ MILLION)
30
25
20
15
10
5
5
10
15
20
25
30
SHARED SAVINGS AT 50%
GOVERNMENT
150% ROI

LTV AEROSPACE AND DEFENSE COMPANY
DISCOUNTED CASH FLOW R.O.I. ANALYSIS

LTV Aerospace and Defense
Vought Aero Products Division

PROJECT:

YEAR:	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
PERIOD:	1	2	3	4	5	6	7	8	9	10

SECTION I - INVESTMENT DATA
1. EQUIPMENT
2. BUILDING
3. OTHER
4. CAPITAL INVESTMENT SUBTOTAL
5. EXPENSES
6. TOTAL INVESTMENT

SECTION II - PROJECT CASH FLOW
7. PRODUCTIVITY SAVINGS REWARD
8. RETAINED PROGRAM SAVINGS
9. COMMERCIAL PROGRAM SAVINGS
10. TOTAL CONTRACTOR SAVINGS
11. COST OF MONEY RECOVERY
12. CAS 409 DEPRECIATION
13. EXPENSE RECOVERY
14. LOST PROFIT EFFECT
15. DEPRECIATION PROFIT
16. SALVAGE VALUE
17. BEFORE TAX CASH FLOW

SECTION III - TAX CALCULATIONS
18. ACRS DEPRECIATION
19. TAXABLE INCOME
20. INCOME TAX
21. INVESTMENT TAX CREDIT
22. EXPENSE TAX ADJUSTMENT
23. AFTER TAX CASH FLOW

SECTION IV - DOD BENEFIT SUMMARY
24. DOD PROGRAM BENEFIT (W/O INCENTIVE)
CUMULATIVE TOTAL
25. DOD PROGRAM BENEFITS (WITH INCENTIVE)
CUMULATIVE TOTAL
26. DOD FUNDING
CUMULATIVE TOTAL
27. DOD NET CASH FLOW
28. DOD CUMULATIVE CASH FLOW NET PRESENT VALUE
29. DOD PAYBACK PERIOD (YEARS)
30. DOD ROI
31. CASH FLOW RATIO
(DOD TO CONTRACTOR, CUMULATIVE)

SECTION V - CONTRACTOR BENEFIT SUMMARY
32. CUMULATIVE CASH FLOW NET PRESENT VALUE
33. RATE OF RETURN W/O INCENTIVE
34. RATE OF RETURN WITH INCENTIVE
35. PAYBACK PERIOD (YEARS)
36. INVESTMENT COST TO SAVINGS RATIO

DATA INPUTS

DOD FUNDING

EXPENDITURES:
EQUIPMENT CAPITAL
EQUIPMENT SALVAGE VALUE
BUILDING CAPITAL
OTHER CAPITAL
OTHER SALVAGE VALUE
EXPENSES

SAVINGS:
DOD SAVINGS
MAJOR PROGRAM SAVINGS
RETAINED PROGRAM SAVINGS
COMMERCIAL SAVINGS
FIRST YEAR OF FULL SAVINGS

CONTRACTOR ANALYSIS FACTORS:
% SHARED SAVINGS
% PROFIT
% GOVERNMENT BUSINESS
TAX RATE
ITC RATE
DISCOUNT RATE
CAS 414 RATE

CONTRACTOR DEPRECIATION:

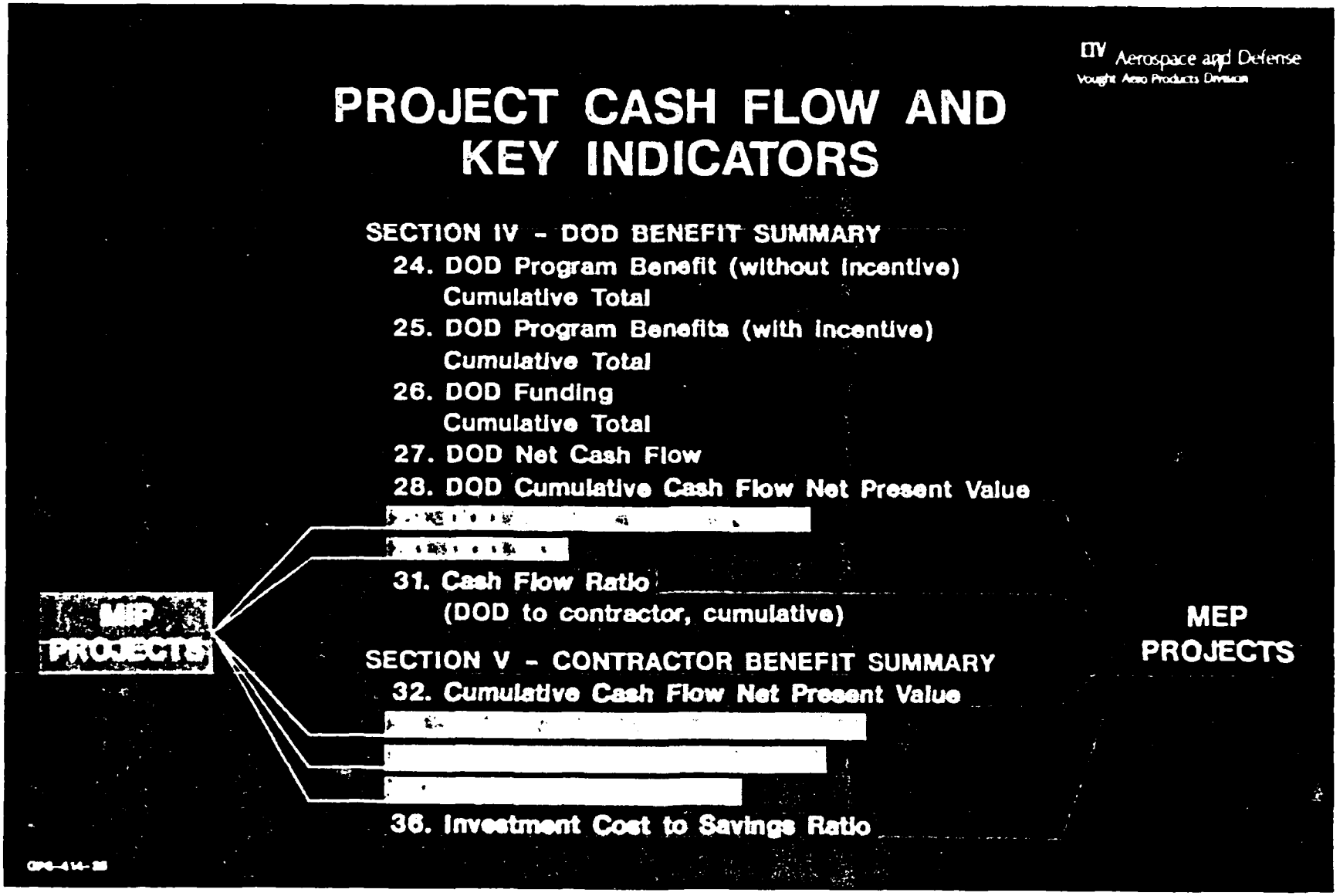
CAS 409 DEPRECIATION -
DEPRECIATION METHOD .....
(1:STRAIGHT LINE; 2:SUM-OF-YEARS; 3:SUM-OF-YEARS/HALF-YEAR;
4:150% DECLINING BALANCE; 5:150% DB, SWITCH TO ST LINE)
ASSET SERVICE LIFE (YEARS)--
EQUIPMENT.....
BUILDING.....
OTHER.....
YEAR PLACED INTO SERVICE.....
ACRS DEPRECIATION -
DEPRECIATION METHOD.....
(1:STANDARD ACRS TABLES; 2:STRAIGHT LINE)
ASSET CLASS (SERVICE LIFE).....(3:3-YR; 5:5-YR; 10:10-YR) -
EQUIPMENT.....
BUILDING.....
OTHER.....
YEAR PLACED INTO SERVICE.....

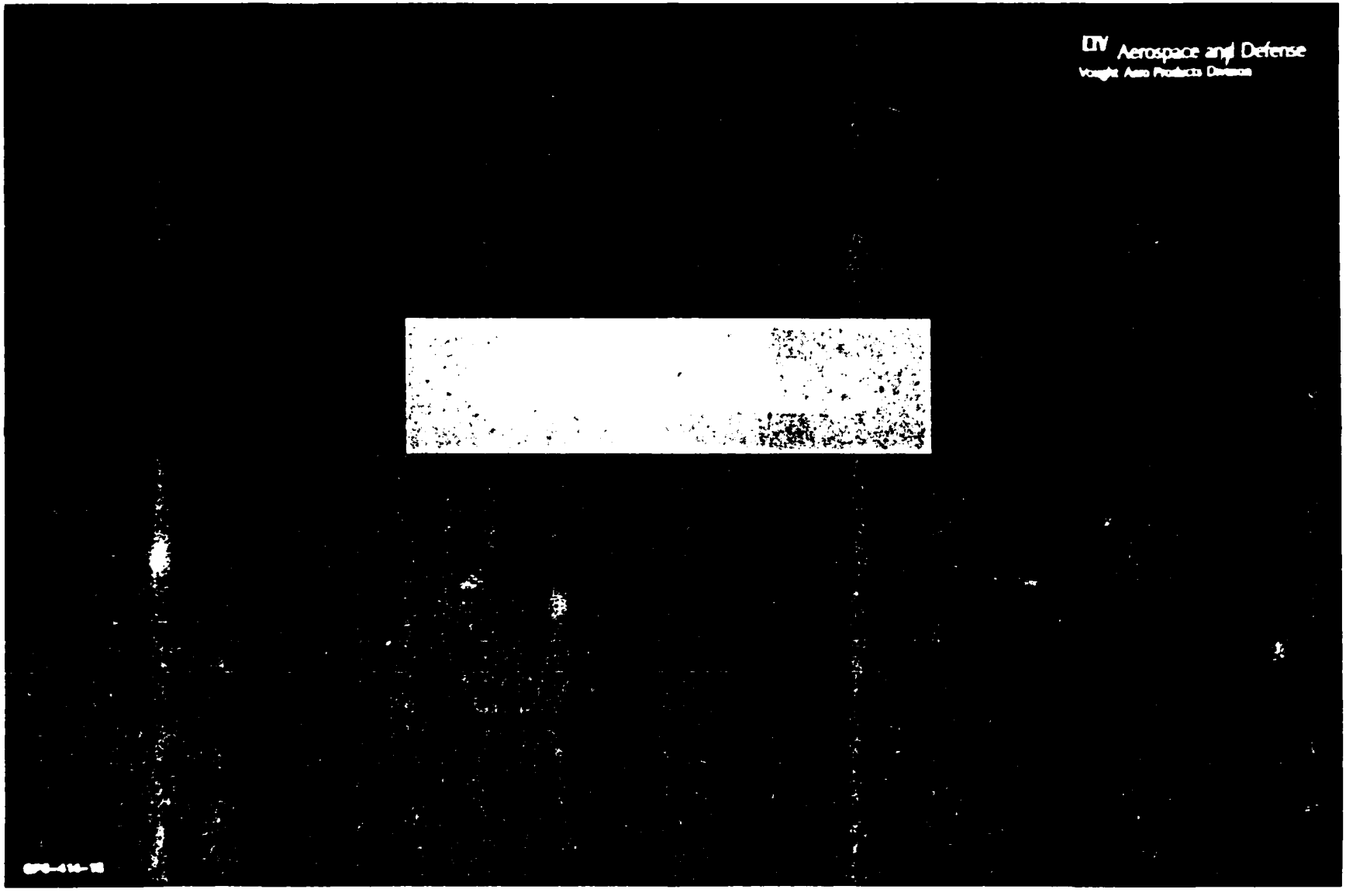
MIP PROJECTS

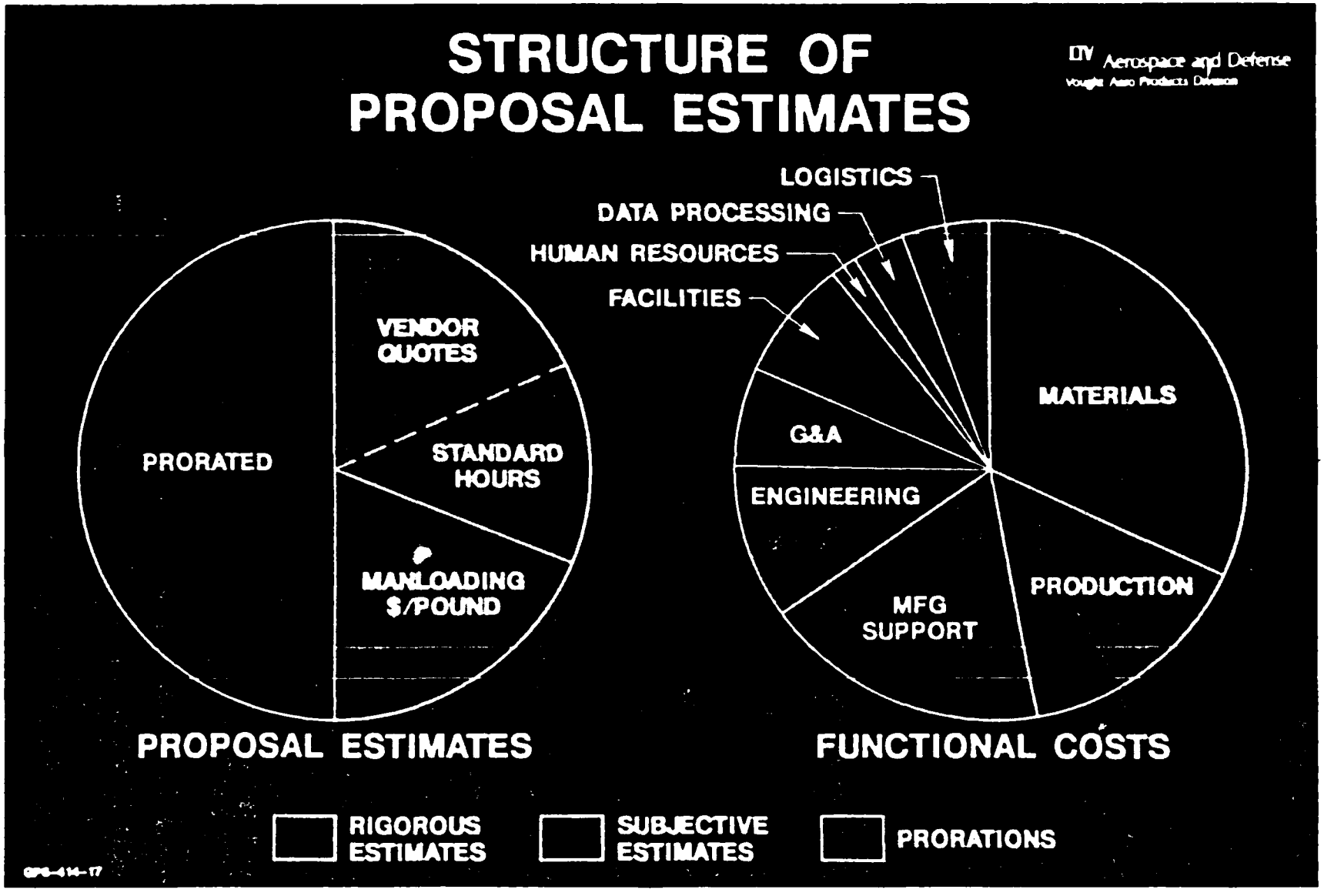
MEP PROJECTS

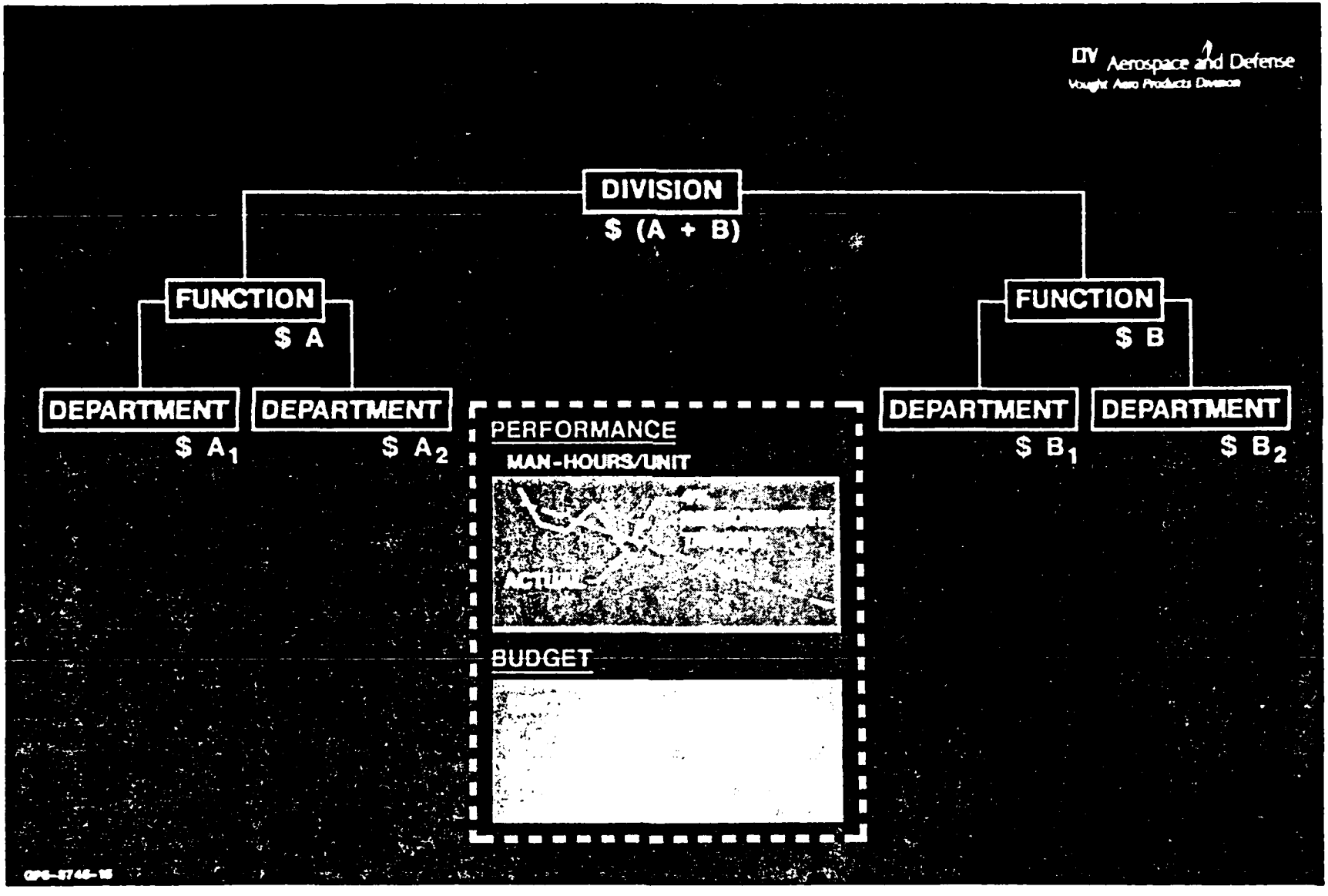
PROJECT CASH FLOW AND KEY INDICATORS

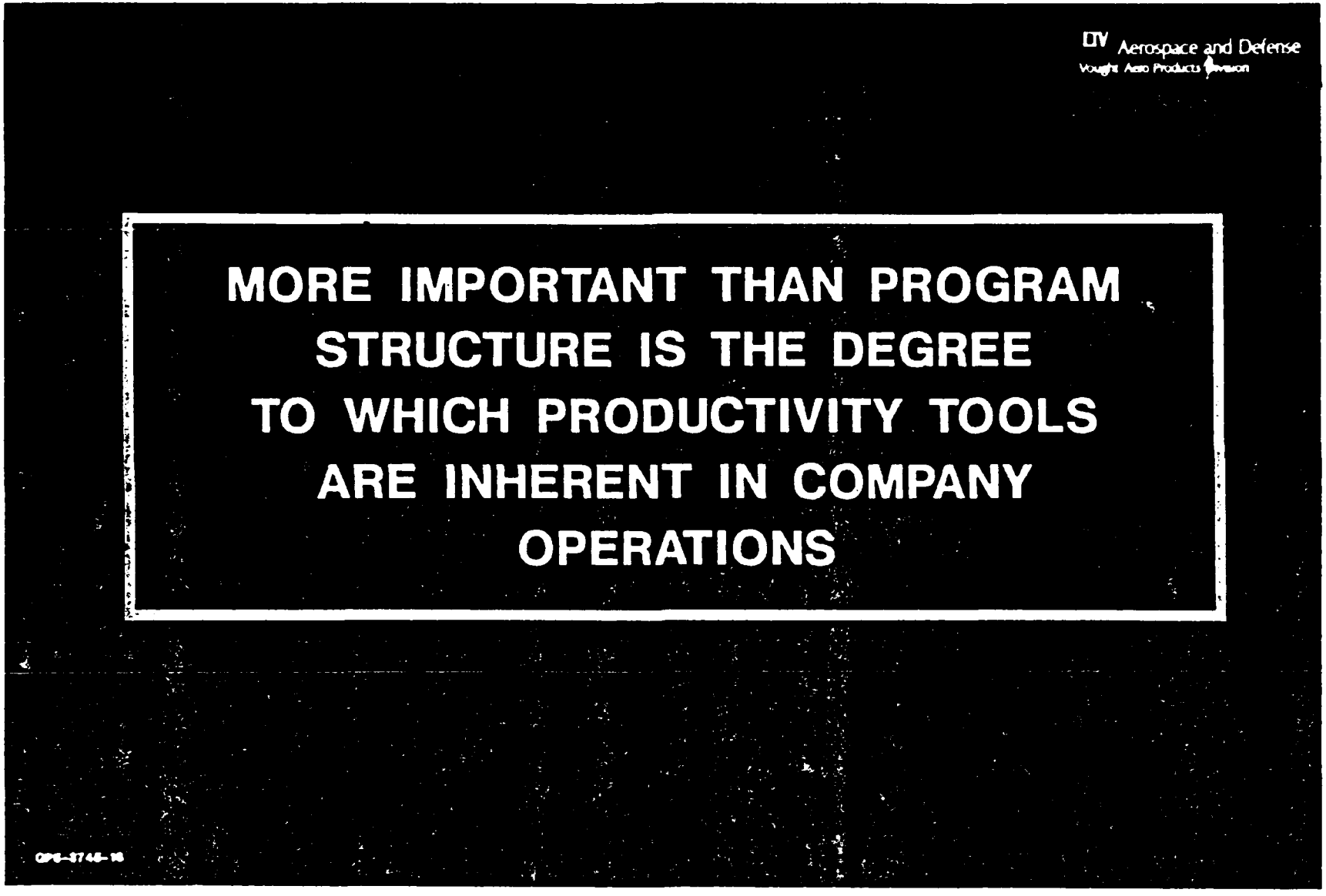
GP6-414-24


LTV Aerospace and Defense
Vought Aero Products Division
PROJECT CASH FLOW AND KEY INDICATORS
SECTION IV - DOD BENEFIT SUMMARY
24. DOD Program Benefit (without incentive) Cumulative Total
25. DOD Program Benefits (with incentive) Cumulative Total
26. DOD Funding Cumulative Total
27. DOD Net Cash Flow
28. DOD Cumulative Cash Flow Net Present Value
31. Cash Flow Ratio (DOD to contractor, cumulative)
MIP PROJECTS
MEP PROJECTS
SECTION V - CONTRACTOR BENEFIT SUMMARY
32. Cumulative Cash Flow Net Present Value
36. Investment Cost to Savings Ratio


LTV Aerospace and Defense
Vought Aero Products Division


STRUCTURE OF
PROPOSAL ESTIMATES
LTV Aerospace and Defense
Vought Aero Products Division
LOGISTICS
DATA PROCESSING
HUMAN RESOURCES
FACILITIES
VENDOR QUOTES
PRORATED
STANDARD HOURS
MANLOADING $/POUND
MATERIALS
G&A
ENGINEERING
MFG SUPPORT
PRODUCTION
PROPOSAL ESTIMATES
FUNCTIONAL COSTS
RIGOROUS ESTIMATES
SUBJECTIVE ESTIMATES
PRORATIONS

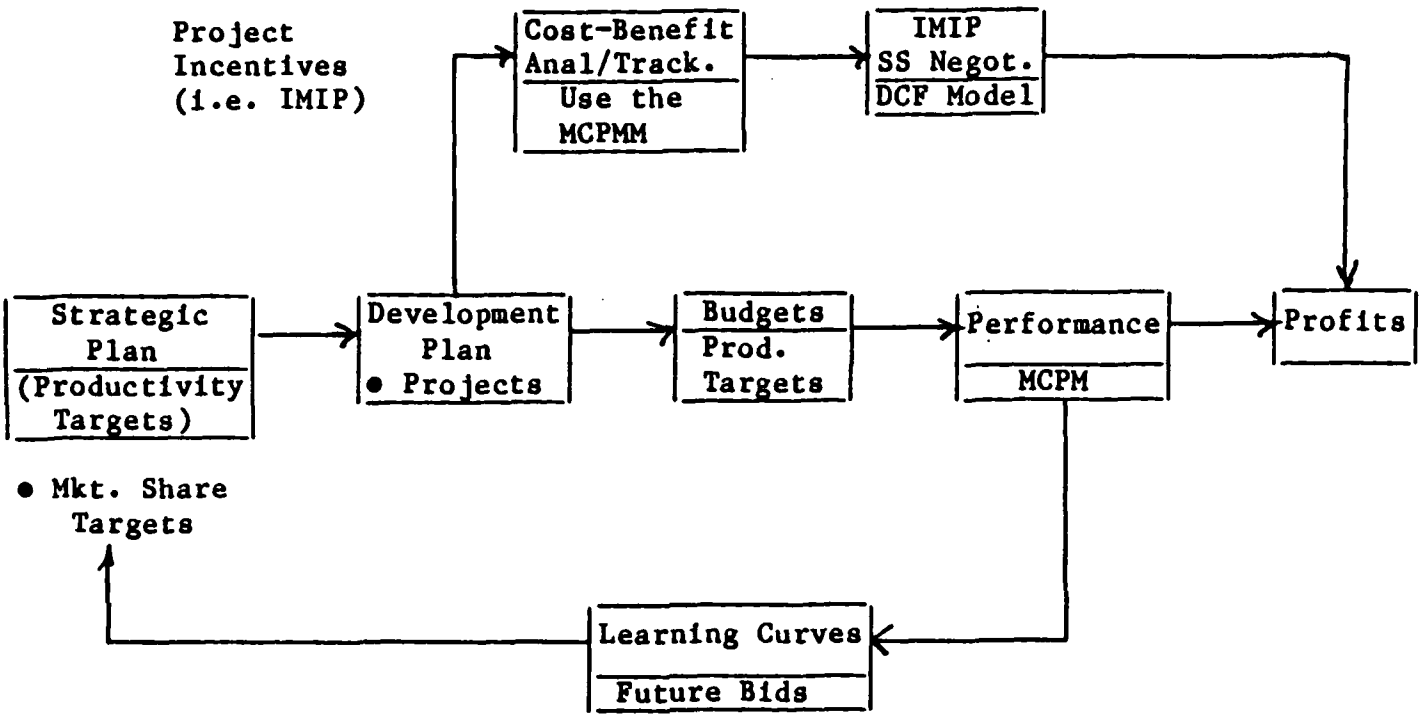

DIV Aerospace and Defense
Vought Aero Products Division
DIVISION
$ (A + B)
FUNCTION
$ A
FUNCTION
$ B
DEPARTMENT
$ A1
DEPARTMENT
$ A2
DEPARTMENT
$ B1
DEPARTMENT
$ B2
PERFORMANCE
MAN-HOURS/UNIT
BUDGET


LTV Aerospace and Defense
Vought Aero Products Division
MORE IMPORTANT THAN PROGRAM STRUCTURE IS THE DEGREE TO WHICH PRODUCTIVITY TOOLS ARE INHERENT IN COMPANY OPERATIONS

VIII.A.2 - LTV/VAPD Integrated Approach

b. VPC Paper Test

FIGURE III-2
Depiction of LTV/VAPD's Basic Approach
to Productivity Management



Comments:
- Process should be self-motivated
- IMIP utilized to minimize lost profit impact
- If there were overall total productivity improvement incentives the company would likely do what Government is after anyway and with less difficulty than by way of project focussed incentives.

Table V-F-1

LTV/VAPC Methodology

Models:

Criteria:	NGT	TPM	Cost-Driver Analysis	MCPM	DCF	Challenge Budgets	Overall System General Comments
1. 2-5 Plan Process		✓				✓	
2. Plan Process Involvement of KDM's							Not Sure
3. Champion							Yes
4. Managing Change							Yes-Council
5. Productivity Basics							Not Clear-Needs Improve.
6. Productivity Restraints dealt w/							Not Clear
7. Stages of Evolution							Not Clear
8. Top Mgmt. Support							Good-Productivity Council
9. Integration into Mgmt. Sys.							Very Good
10. Integration of Planning Sys.							Very Good
11. Participative Mgmt.							Needs Improvement
12. Link Planning to Implem.				✓		✓	Very Good
13. Budget Mgmt.				✓		✓	Excellent
14. Prod. Measurement Sys. Dev.							Excellent
15. Meas. Audits							Not Clear
16. Control vs. Imp. Meas. & Eval.		Planning	Improve.	Improv.	Plann.	Control	Excellent
17. Meas. A While Hope for B							Not Clear
18. Meas. & Eval. as Mgmt. Sys.							Excellent
19. Personalized Scoreboards				✓			Needs Development
20. Control & Improve. Sys. Dev.	✓	✓	✓			✓	
21. Audit C&I Sys's							Not Clear
22. Reward A While Hope for B							Not Clear
23. Innovation Promoted	✓						Needs Development
24. Cost-Driver Analysis			✓				Excellent
25. M&E → C&I	✓	✓	✓	✓		✓	Excellent
26. Sys. Optimization							Very Good
27. Win/Win Situations Set Up							Not Clear
28. Part. Mgmt.	✓			✓			Needs Improvement
29. Mgmt. Basics			✓			✓	Good
30. Accountability				✓		✓	Good
31. Maintain Excellence							Shared Savings-Gainsharing
32. Mgmt. Understanding			(councils	promote	this)		Not Clear
33. Self Motivating							Not Clear
34. Simplicity							A Major Weakness

VIII.A.3 - CDEF

a. Price Waterhouse Presentation

Price Waterhouse

Manufacturing &
Cost Management
Services

PAPER TEST

COST DEFINITION (CDEF) METHODOLOGY

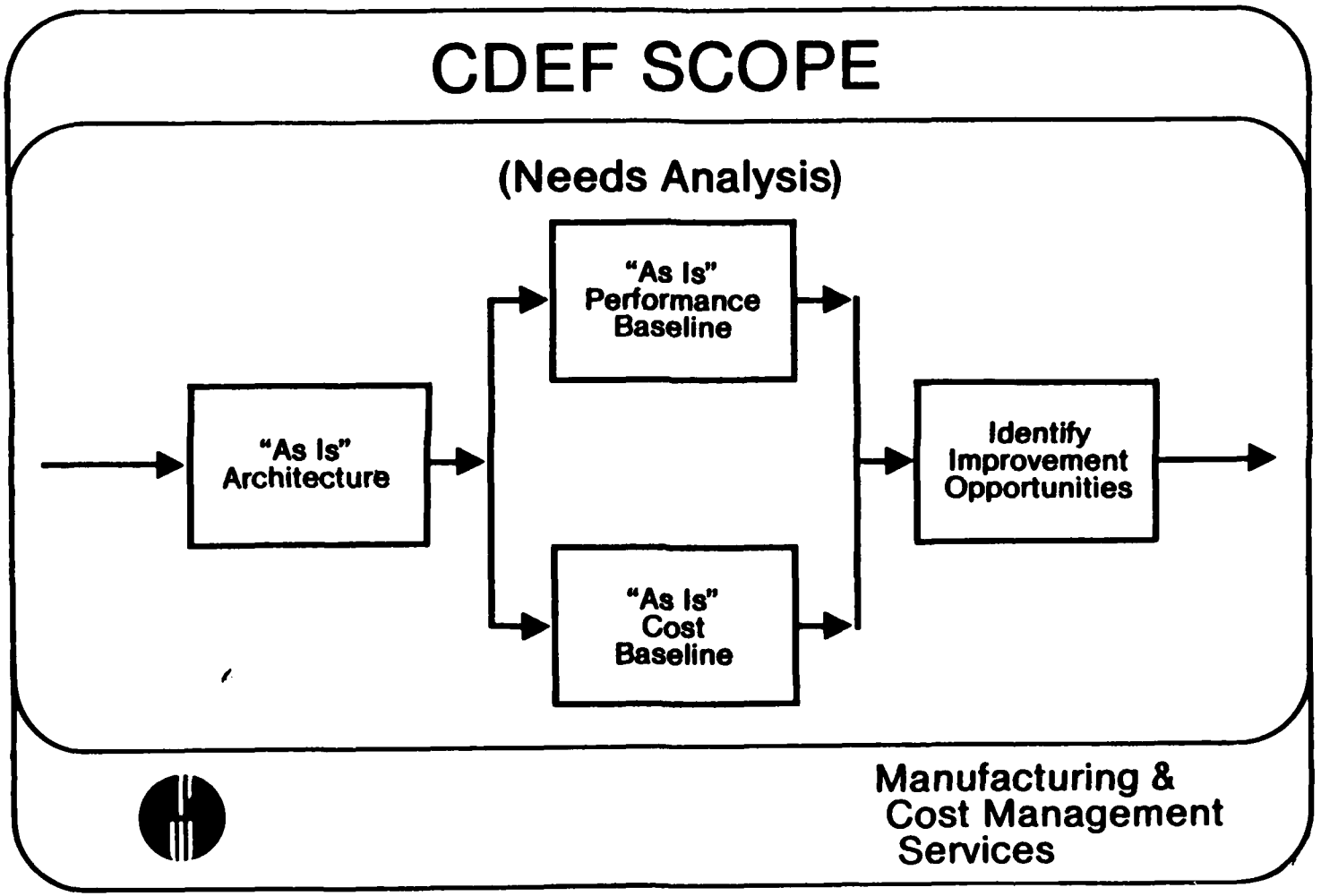
Manufacturing &
Cost Management
Services

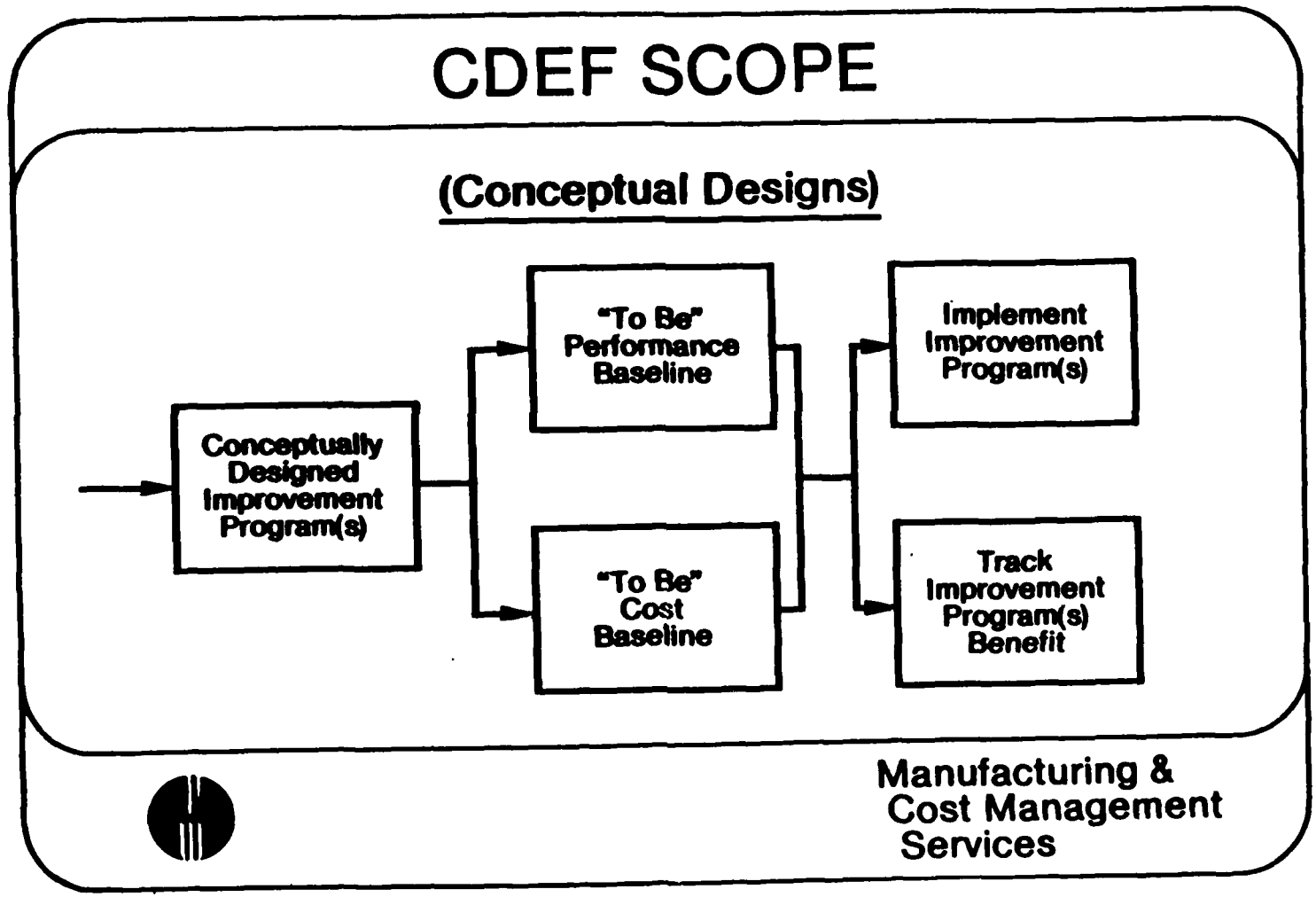
CDEF SCOPE

CDEF Is:

- A technology modernization planning and management methodology
- A cost-benefit analysis process
- A cost-benefit tracking approach
- A performance measurement technique

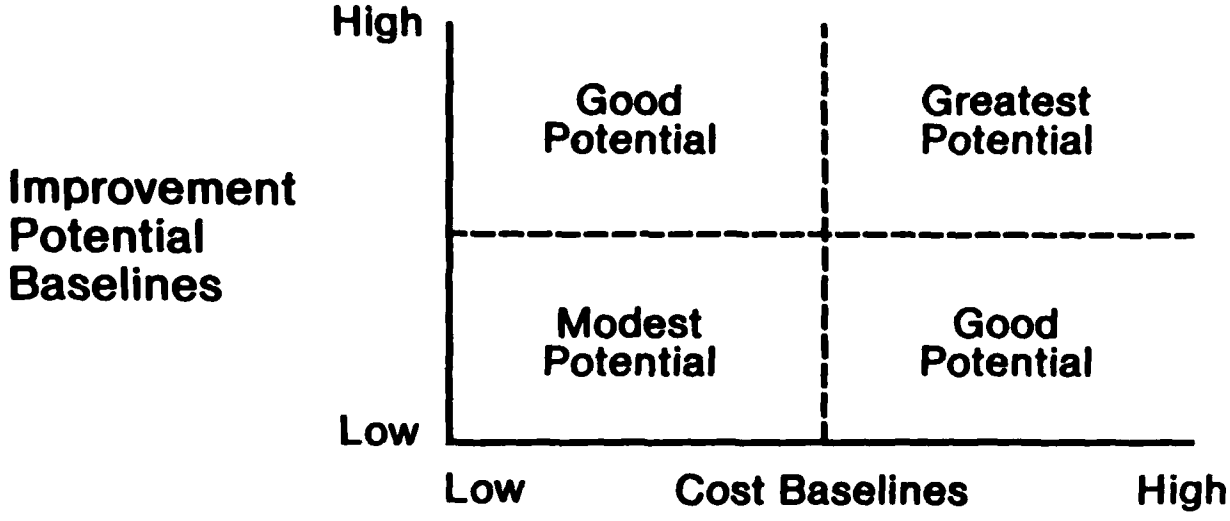
Manufacturing &
Cost Management
Services


CDEF SCOPE
(Needs Analysis)
"As Is" Architecture
"As Is" Performance Baseline
"As Is" Cost Baseline
Identify Improvement Opportunities
Manufacturing & Cost Management Services


CDEF SCOPE
(Conceptual Designs)
Conceptually Designed Improvement Program(s)
"To Be" Performance Baseline
"To Be" Cost Baseline
Implement Improvement Program(s)
Track Improvement Program(s) Benefit
Manufacturing & Cost Management Services

CASE EXAMPLE

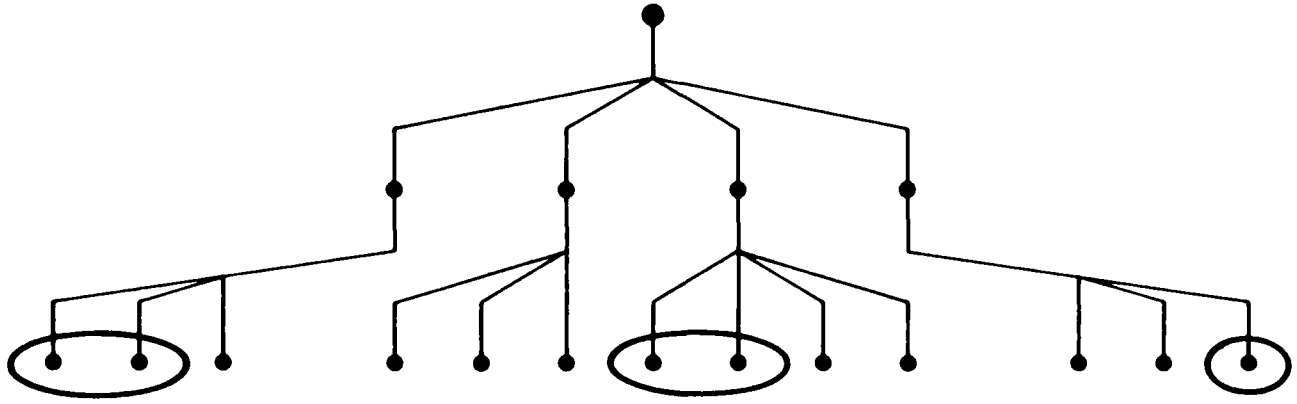
Opportunity Matrix



Manufacturing & Cost Management Services

SUCCESS STORY

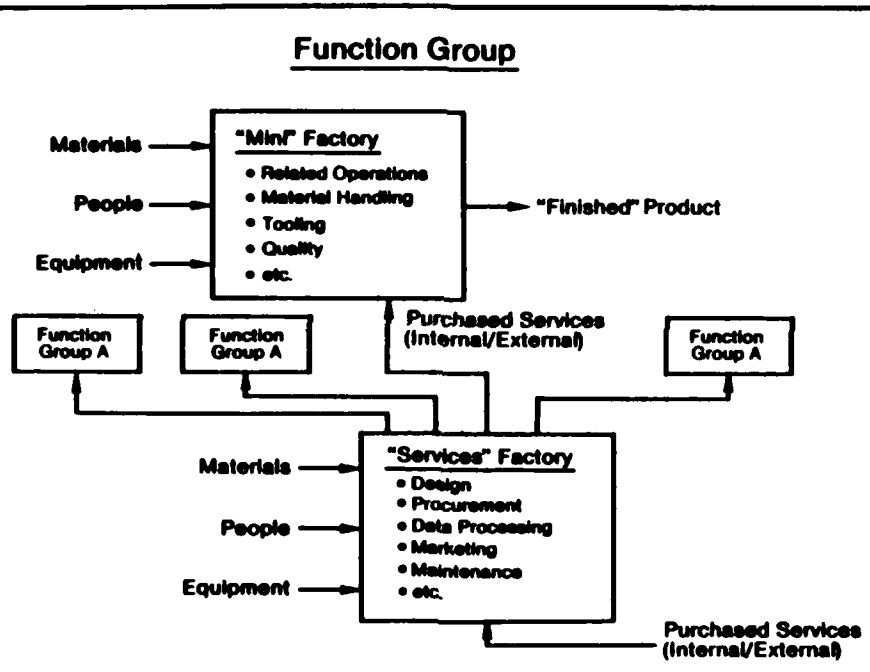
"As Is" Architecture



Function Group "N"

Manufacturing &
Cost Management
Services

SUCCESS STORY



Manufacturing & Cost Management Services

SUCCESS STORY

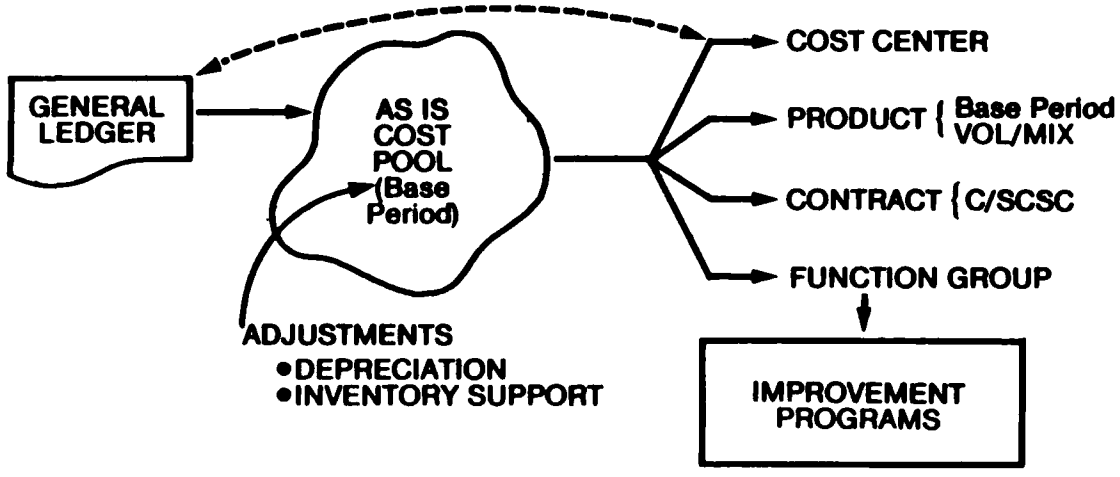
Performance Measurement Criteria

- Direct Labor Hours
- Indirect Labor Hours
- Equipment Availability
- Schedule Adherence
- Equivalent Production Units
- Utility Consumption
- Set Up Hours
- Throughput Time

Manufacturing &
Cost Management
Services

CASE EXAMPLE

Cost Baseline Logic



Manufacturing & Cost Management Services

TOOLS

AUTOMATIC COST BASELINE GENERATOR

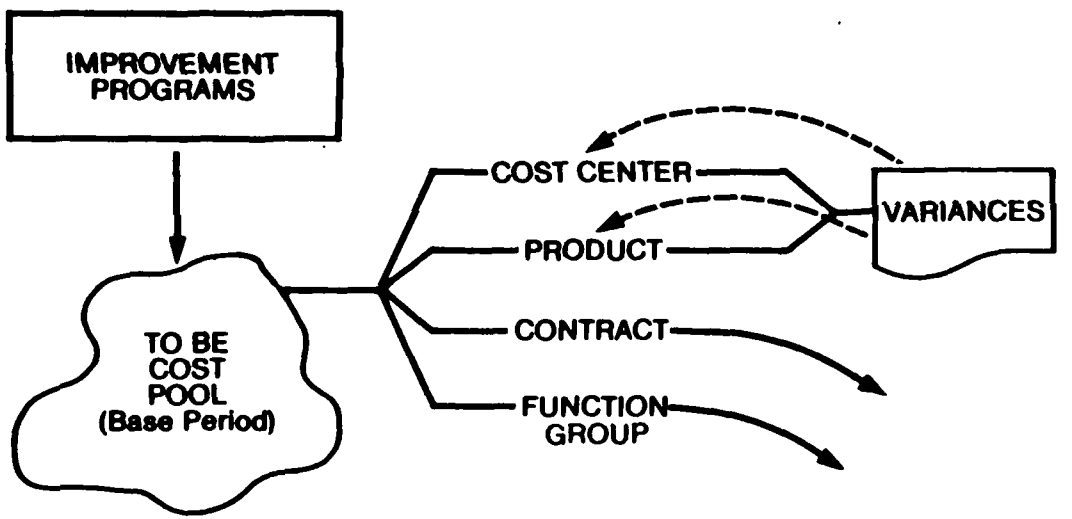
(ACBG)

- PROVIDES FOCUSED STRUCTURE
- SIMPLIFIES ALLOCATION CALCULATIONS
- PROVIDES "WHAT IF" CAPABILITY

Manufacturing &
Cost Management
Services

CASE EXAMPLE

Cost Baseline - Logic (cont.)



Manufacturing & Cost Management Services

EXPERIENCES

- CLEVELAND PNEUMATIC
- EX-CELL-O / ACE
- EX-CELL-O / ELWOOD
- BOEING MILITARY (ISMC)
- GENERAL DYNAMICS/FORT WORTH (AMS)
- BOEING AEROSPACE
- GOODYEAR AEROSPACE
- McDONNELL DOUGLAS (C17)
- McDONNELL DOUGLAS (ICC)
- ONTARIO FORGE
- DURADYNE
- ALUMINUM FORGE
- HONEYWELL UNDERSEA

Manufacturing &
Cost Management
Services

PAPER TEST METHODOLOGY

Manufacturing &
Cost Management
Services

PAPER TEST

LTV TEST SITE MEETING

PROJECT TEAM:

RAY THORNTON	-	LTV
LEN THORPE	-	LTV
GENE KLEIN	-	PW
BETTY THAYER	-	PW
MARVIN AGEE	-	VPI

Manufacturing &
Cost Management
Services

PAPER TEST

CONCLUSIONS / RECOMMENDATIONS

- DEVELOP BETTER CDEF DESCRIPTION MANUAL
- DEVELOP CDEF USERS TRAINING
- DEVELOP USER FRIENDLY DOCUMENTATION FOR CDEF AND ACBG
- DEVELOP BETTER EXAMPLE OF COST MODEL AND GENERAL LEDGER ALLOCATION PROCESS

Manufacturing &
Cost Management
Services

PAPER TEST

CONCLUSIONS / RECOMMENDATIONS (CONT.)

- DOCUMENT INFORMATION FLOW FROM DATA COLLECTION TO SHARED SAVINGS CALCULATION
- FULL SCOPE FIELD TEST OF CDEF AT LTV TOO EXPENSIVE
- DEVELOP / TEST COMPREHENSIVE PRODUCTIVITY GUIDE

VIII.A.3 - CDEF

b. LTV Paper Test

LTV Aerospace and Defense
Vought Aero Products Division

PAPER TEST RESULT FORMAT

PRICE WATERHOUSE CDEF COST BENEFIT ANALYSIS MODEL

DATA SOURCE DESCRIPTION	REQUIREMENTS		DIFFICULTY IN USE
	INPUT	OUTPUT	EASE OF USE

LTV Aerospace and Defense
Vought Aero Products Division

CDEF PAPER TEST

Price Waterhouse's CDEF model is very detailed and probes to the lowest level of contractor's activity

The model offers the opportunity to mimic company cost characteristics

The model relies on activity-based costing that is not always compatible with contractor's organizational structure-based cost data

Resource requirements are extensive and output format is detailed and voluminous

"To-be" cost development is derived from alterations to "as-is" cost case

In some instances, detailed cost data is not available to match the detail found in the node tree structure

LTV Aerospace and Defense

CDEF PAPER TEST

Model could require the creation of a separate cost allocation/tracking infrastructure

Extensive resource requirements will limit field test viability

Utilizing the model on a company-wide field test would entail efforts beyond the scope or timetable available in this contract

Field test will need to be scaled down in scope to match contractual resource constraints

The model can be applied to a functional area of the test site and generate the necessary evaluative data within contractual constraints

VIII.A.4 - MFPMM

a. VPC Presentation

(1) Basic MFPMM eqtn. Profit = Productivity x Price Recovery

(2) $$\frac{\text{SALES}}{\text{COSTS}} = \frac{\text{OUTPUT}}{\text{INPUT}} \times \frac{\text{OUTPUT PRICE}}{\text{INPUT PRICE}}$$

(3) Δ Profit = Δ Productivity x Δ Price Recovery

(4) $$\Delta \text{ Profit} = \Delta \text{ Prod.} \times \underbrace{\frac{\Delta \text{ OUTPUT PRICE}}{\Delta \text{ INPUT PRICE}}}$$

Forecasted (i.e. — we know these from published data or can constrain Δ Output price to gain competitive edge.

(5) $$\Delta \text{ Product Price or} = \Delta \text{ Prod.} \times \underbrace{\frac{\Delta \text{ Input Price}}{\Delta \text{ Profit}}}$$

forecasted

from eqtn. (5), we can develop strategic objectives for product pricing and annual productivity improvement that are interrelated.

FIGURE VII-C-1: Basic MFPMM Equation and its Derivation to Show How the Model is Utilized by LTV.

Section V.-B.-3

Table 5-3

MULTI FACTOR PRODUCTIVITY MEASUREMENT

VPI/VTPC VERSION MPMM-2

	BASE PERIOD (0) PERIOD 1 LAST YEAR			CURRENT PERIOD PERIOD 2, 3, 4, 5, 6 FORECASTED YEARS			WEIGHTED CHANGE RATIOS			COST/REVENUE RATIOS		PRODUCTIVITY RATIOS		WEIGHTED PERFORMANCE INDEXES			TOTAL EFFECTS ON PROFITS		
														CHANGE IN PRODUCTIVITY	CHANGE IN PRICE RECOVERY	CHANGE IN PROFITABILITY	CHANGE IN PRODUCTIVITY	CHANGE IN PRICE RECOVERY	CHANGE IN PROFITABILITY
	QUANTITY Q_{i1}	PRICE P_{i1}	VALUE $(Q_{i1}XP_{i1})$	QUANTITY Q_{i2}	PRICE P_{i2}	VALUE $(Q_{i2}XP_{i2})$	$\frac{Q_{i2}P_{i1}}{Q_{i1}P_{i1}}$	$\frac{Q_{i2}P_{i2}}{Q_{i1}P_{i1}}$	$\frac{Q_{i2}P_{i2}}{Q_{i1}P_{i1}}$	$\frac{I_{i1}}{\Sigma(Q_{i1}XP_{i1})}$	$\frac{I_{i2}}{\Sigma(Q_{i2}XP_{i2})}$	PERIOD 1	PERIOD 2	(7/7)	(17/15)	(11/10)			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
(OUTPUT(S)) $O_{i...n}$																			
ΣO_i																			
INPUT(S) $I_{i...}$																			
LABOR I_{iL}																			
ΣI_{iL}																			
MATERIAL I_{iM}																			
ΣI_{iM}																			
ENERGY I_{iE}																			
ΣI_{iE}																			
INVESTMENT I_{iI}																			
ΣI_{iI}																			
SERVICES I_{iS}																			
ΣI_{iS}																			
ETC.																			
TOTAL INPUTS $\Sigma I_{i...n}$	NOT USED AT MACRO LEVEL			NOT USED AT MACRO LEVEL			IMPLICIT IN MODEL			PIE CHART DATA USED TO TARGET PRODUCTIVITY IMPROVEMENTS		NOT DIRECTLY CALCULATED		DRIVEN	FORECASTED	ESTABLISHED			CALCULATED
DIFFERENCE																			

Figure 5

VIII.A.4 - MFPMM

b. LTV Paper Test

LTV Aerospace and Defense
Vought Aero Products Division

MFPMM PAPER TEST

The model examines contractor effort at the company or macro level

Practical application of the model is found in the total factor productivity model used at LTV's Vought Aero Products Division

The model is driven by unit measures of price and quantity to yield "value"; these unit measures are not always available, but total value for cost categories will be available

The lack of price and quantity data could affect model-generated indices and ratios

Due to long cycle times, product mix changes, customizations and other configuration changes, the product and resources from one period to the next are often not identical

The model's period-to-period comparisons are meaningful, but are restricted at LTV to "program output values"

LTV Aerospace and Defense
Vought Aero Products Division

MFPMM PAPER TEST

The model can be customized to fit the long cycle times and ever-changing product mix in the aerospace environment by defining output at the program level - one entry per program per period

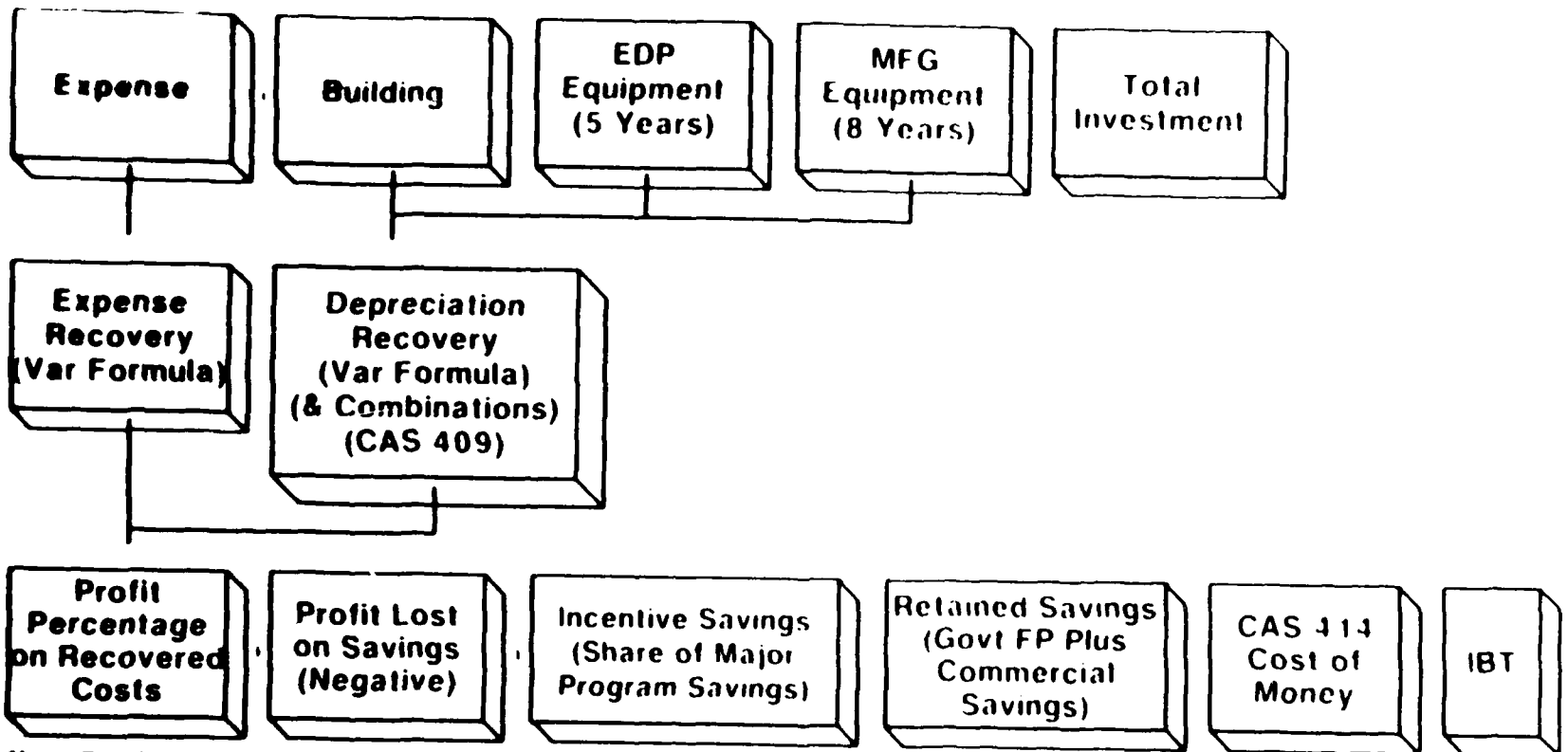
This alternative approach to defining the product would overcome problems due to product mix changes and partial quantities to allow application of the model to LTV cost data bases

The model can be adapted to a field test

VIII.A.5 - DCF/SSA

a. Westinghouse Presentation

IMIP DCF / SSA Approach



Note: The IRR Represents the Rate at Which the Sum of the Yearly Returns Are equal to the Sum of the Yearly Investments

Westinghouse DCF / SSA Model

- **Based on Execucom Systems Corporation's Interactive Financial Planning System (IFPS) Software Package**

- **Inputs**
  - **Project Expense**
  - **Project Capital**
  - **Savings**
    - **Total Government**
    - **Major Program**
    - **Commercial**

- **Outputs**

  Depreciation Recovery (CAS 409)
  Expense Recovery
  Cost of Money (CAS 414)
  Profit on Recoverables
  Loss on Savings
  Retained Savings

WESTINGHOUSE DCF SSA MODEL

[illegible]

SAMPLE [illegible] ANALYSIS REPORT

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	TOTAL
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	500.0						10000.0
[illegible]		[illegible]	[illegible]	4000.0	1000.0						12000.0
[illegible]		[illegible]	[illegible]	4000.0	1000.0						12000.0
TOTAL [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1410.0	1400.0	1410.0	1290.4	[illegible]
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NET CASH FLOW	[illegible]	-1646.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	717.9	411.3	5761.8
[illegible]	[illegible]										
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

WESTINGHOUSE DCF/SSA MODEL

```
  MODEL TM  VERSION OF  12/20/85  08:30
 10 COLUMNS 1-11
 20 EXPENSE = 0
 30 BUILDING = 0
 33 CUM BLDG = L30 + PREVIOUS L33
 36 PREV BLDG BASE = L33 - L30
 40 EQUIPMENT 5 = 0
 43 CUM EQUIP 5 = L40 + PREVIOUS L43
 46 PREV EQUIP 5 BASE = L43 - L40 - PREVIOUS 5 L43
 50 EQUIPMENT 8 = 0
 53 CUM EQUIP 8 = L50 + PREVIOUS L53
 56 PREV EQUIP 8 BASE = L53 - L50 - PREVIOUS 8 L53
 60 EQUIPMENT = L40 + L50
 70 CASH FLOW ADJ = 0
 80 CAPITAL = L30 + L60 + L70
 90 TOTAL INVESTMENT = L20 + L80
100 STLBLDGDEP = (L30/90) + (L36/45)
103 CUMSTLBLDGDEP = L100 + PREVIOUS L103
106 BLDG BK VALUE = L33 - L103
110 ACRS DEPR(15,1984,BUILDING,ACC BLDG DEP)
120 STL EQ5 DEP = ((L40 + PREVIOUS 5 L40)/10) + (L46/5)
123 CUM STL EQ5 DEP = L120 + PREVIOUS L123
126 EQ5 BK VALUE = L43 - L123
130 STL EQ8 DEP = ((L50 + PREVIOUS 8 L50)/16) + (L56/8)
133 CUM STL EQ8 DEP = L130 + PREVIOUS L133
136 EQ8 BK VALUE = L53 - L133
140 ACRS DEPR(5,1984,EQUIPMENT,ACC EQ DEP)
150 ST L DEPRECIATION = L100 + L120 + L130
160 ACC DEPRECIATION = ACC BLDG DEP + ACC EQ DEP
170 TOTAL BOOK VALUE = L106 + L126 + L136
180 DEPR RECOVERY = .94 * (( .95 * L150) + ( .05 * PREVIOUS L150))
190 EXP RECOVERY = .94 * (( .95 * L20) + ( .05 * PREVIOUS L20))
200 GOVT SAVINGS = 0
210 COMM SAVINGS = 0
220 [illegible] SAVINGS = 0
230 INCENTIVE SAVINGS = [illegible]L220 FOR 5, .25 * L220, [illegible]L220
240 RETAINED SAVINGS = ( .[illegible] * L200) + L210
250 PROFIT [illegible] = .12 * .94 * (L80 + L150)
260 [illegible] PROFIT = .50 * (L250 + PREVIOUS L250)
270 [illegible] = - .12 * L200
280 [illegible] = .50 * (L270 + PREVIOUS L270)
290 [illegible] = [illegible] .94 * ( .50 * (L170 + PREVIOUS L170))
300 [illegible] = L[illegible] + L[illegible] + L[illegible] + L290
310 [illegible] = [illegible]
320 INTEREST [illegible] = .08 * L60
330 ACC [illegible] = .46 * (L160 - L100)
340 [illegible] = .46 * (L[illegible] - L[illegible])
350 [illegible] = L[illegible] + [illegible] + L310 + L320 + L330 + L340 - L90
360 [illegible]
370 [illegible] = 0, [illegible] FOR [illegible]
380 [illegible] = [illegible](L370, L3[illegible])
390 [illegible] = [illegible](L3[illegible], 10) * 100 0
400 COLUMN 11 FOR L20 THRU L370 = SUM(C1 THRU C10)
END OF MODEL
```

WESTINGHOUSE DCF/SSA MODEL

DATAFILE FOR SAMPLE ROI ANALYSIS

```
READY FOR EDIT. LAST LINE IS 0
,
  1 EXPENSE= 750,3750,2500,2500,500,0,0,0,0,0
2 BUILDING= 0 FOR 10
3 EQUIPMENT= 0 FOR 10
4 EQUIPMENT DP= 0,2000,5000,4000,1000,0,0,0,0,0
5 CASH FLOW ADJ = 0 FOR 10
6 CONT SAVINGS=0,250,5000,5250,7500,10000,10500,12000,12500,15000
7 CONN SAVINGS=0,0,50,75,300,600,650,650,700,750
8 MAJOR PROC SAVINGS=0,150,4500,5000,5000,7500,9000,9500,10000,10500
,
```

REPORT FILE FOR SAMPLE ROI ANALYSIS

```
 REPORT TH  VERSION OF  08/11/85  10:54
 1 FORMAT                     11I [illegible].D1
 2 COLUMNS 1-11
 3 NODATES
 4 CENTER SAMPLE ROI ANALYSIS REPORT
 5 8
 6 COLUMN TITLES  YEAR 1, YEAR 2, YEAR 3, YEAR 4, YEAR 5, YEAR 6,'
 7                YEAR 7, YEAR 8, YEAR 9, YEAR 10, TOTAL
 8 UNDERLINE
 9 8
10 L20, SPACE, L40, L30, L70, L80, SPACE, L90, SPACE 2
11 L230, L180, L190, L260, L200, L250, L240, SPACE 2
12 L300, L310, L320, L330, L340, SPACE 2
13 L350, SPACE, L370
14 SPACE 2, L200, L210, L220
END OF REPORT
```

LMI DISCOUNTED CASH FLOW MODEL

		1984	1985	1986	1987
Year:		1	2	3	4
SECTION I. CASH DATA					
1 Contractor Investment		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
2 Contractor Expenses		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
3 DoD/Government Funding		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
4 Savings Available to DoD		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
SECTION II. INCREMENTAL CASH FLOWS					
5 Productivity Savings Source		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
6 Cost of Money (CAS 414)	8%	0.0	0.0	0.0	0.0
7 CAS 409 Depreciation		0.0	0.0	0.0	0.0
8 Profit Effect		0.0	0.0	0.0	0.0
9 Incremental DoD Cash Flows to Contractor		0.0	0.0	0.0	0.0
10 Savings Taken		0.0	0.0	0.0	0.0
11 Contractor Before-Tax Cash Flow		0.0	0.0	0.0	0.0
SECTION III. TAX CALCULATIONS					
12 ACRS Depreciation		0.0	0.0	0.0	0.0
13 Contractor Taxable Income		0.0	0.0	0.0	0.0
14 Contractor Income Tax	37%	0.0	0.0	0.0	0.0
15 Investment Tax Credit	10%	0.0	0.0	0.0	0.0
16 Contractor After-Tax Cash Flow		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
SECTION IV. SUMMARY					
17 DoD Program Benefit (Without Incentive)		0.0	0.0	0.0	0.0
Cumulative Total	80.0	0.0	0.0	0.0	0.0
18 DoD Program Benefit (With Incentive)		0.0	0.0	0.0	0.0
Cumulative Total	80.0	0.0	0.0	0.0	0.0
19 DoD Payback Period	0.0	years			
20 Government Benefit		0.0	0.0	0.0	0.0
Cumulative Total		0.0	0.0	0.0	0.0
21 Government Payback Period	0.0	years			
22 Contractor Internal Rate of Return					
Without Incentive	0.0%				
With Incentive	0.0%				
23 Contractor Payback Period	0.0	years			

MODEL INPUTS:	Year	1984	1985	1986	1987
Contractor Investment					
Contractor Expenses					
DoD/Government Funding					
Savings Available to DoD					
Productivity Savings Source					
Profit Effect					
Savings Taken					
CAS 414 Rate	8%				
CAS 409 Depreciation:					
Depreciation Method	1				
(1:Straight Line; 2:Sum-of-Years; 3:Sum-of-Years/Half-Year; 4:1986 Remaining Balance; 5:1986 DB, Switch to SL Line)					
Asset Service Life (years)	0				
Year Placed into Service	1				
ACRS Depreciation:					
Depreciation Method	1				
(1:Standard ACRS Tables; 2:Straight Line)					
Asset Class (Service Life)	0				
(3: 3-yr; 5: 5-yr; 10: 10-yr)					
Year Placed into Service	1				
Contractor Tax Rate	37%				
Investment Tax Credit Rate	10%				
Completion Contract - Tax Lag	0	years	(0 implies no lag)		

DCF / SSA Model Comparison

- **LMI Model**
  - **Flexible (Not Controllable)**
  - **Based on Lotus 1-2-3**
  - **Requires Extensive Off-Line Development of Some Inputs and Most Outputs**

DCF / SSA Model Comparison

- **Westinghouse IFPS Model**
  - Features On-Line Calculation of Most Inputs
  - Requires Specific Inputs
    - Total Government Savings
    - Commercial Savings
    - Major Program Savings
    - Captial Investment by Category
- **Calculates On-Line**
  - Incentive Savings
  - Depreciation Recovery (CAS 409)
  - Expense Recovery
  - Cost of Money (CAS 414)
  - Profit on Recoverables
  - Loss on Savings
  - Retained Savings
- **Does Not Calculate DoD / Government Benefits (Can Be Added)**

DCF / SSA Model Comparison

Inputs	LMI	Westinghouse
Project Expense	Similar	Similar
Project Capital	One Lump Sum	Multiple Inputs
Total Govt Savings	C...-Line	Accommodates
Major Program Savings	Off-Line	Accommodates
Commercial Savings	Off-Line	Accommodates

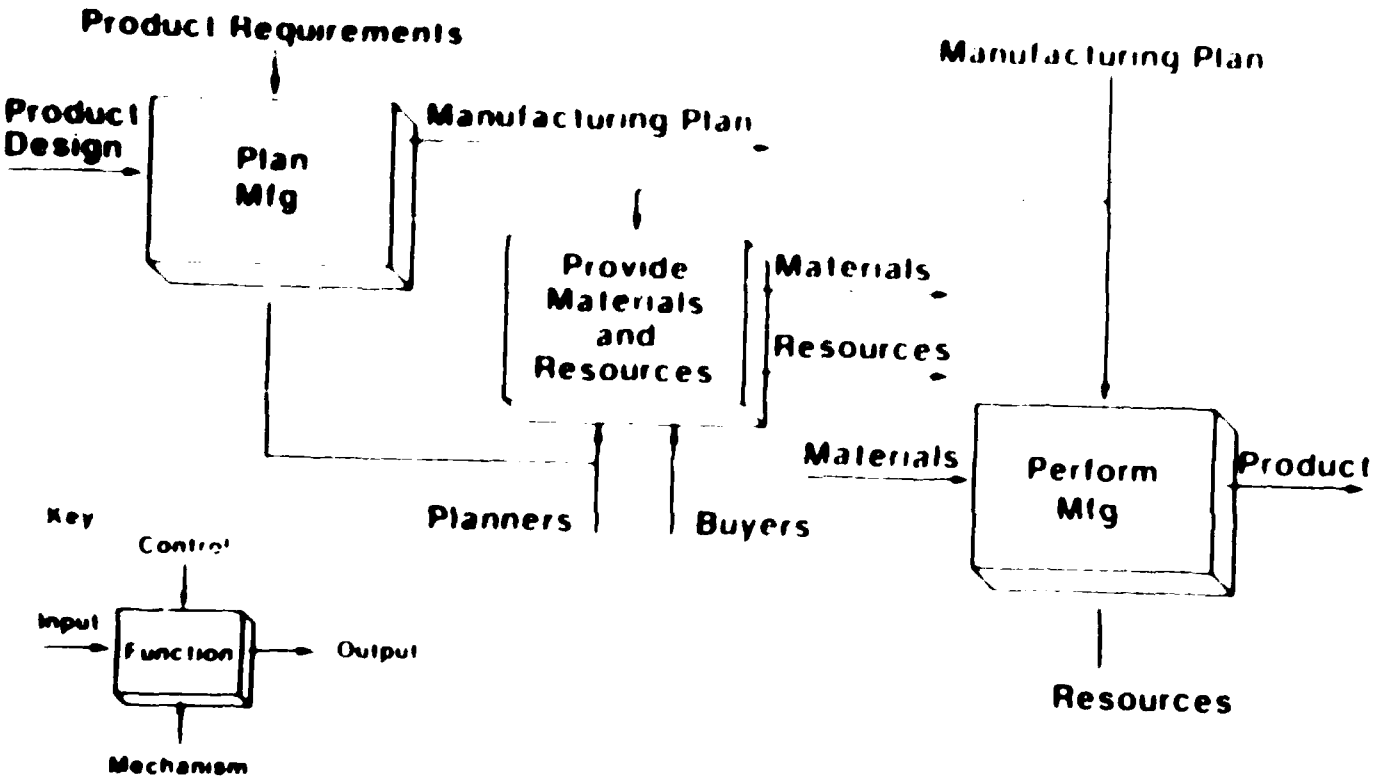
DCF / SSA Model Comparison

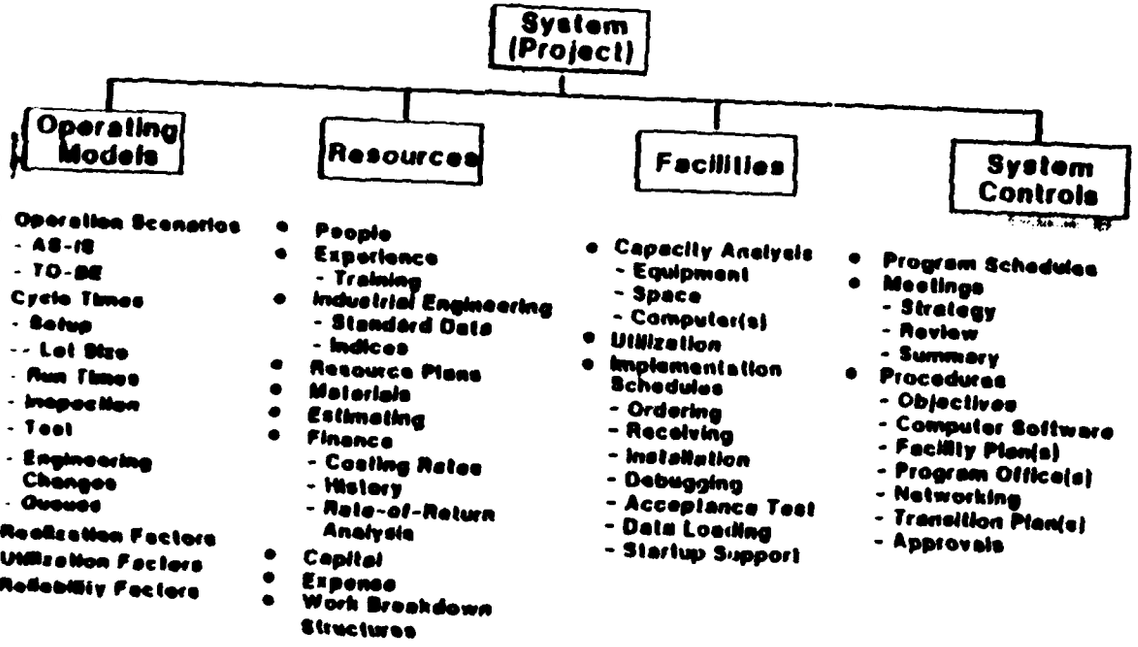
Outputs	LMI	Westinghouse
Depreciation Recovery (CAS 409)	F ve Methods	Set Any Method
Expense Recovery	Extraneous	Included
Cost of Money	No Discount for Commercial Business	Discounts for Commercial Business
Profit on Recoverables	Extraneous	Included
Loss on Savings	Extraneous	Included
Retained Savings	Extraneous	Included

DCF / SSA Model Application

- Perform Top-Down Structured Factory-Wide Analysis
- Utilize Structured Cost Benefits Analysis Methods
- CBA MUST BE IN COMPLIANCE With:
  - DD633 Format
  - Cost Accounting Standards
  - Contractor Disclosure Statement
  - Negotiated Rates and Factors
- Perform DCF Rate-of-Return Analysis
  - Establish Acceptable Hurdle Rate
  - Calculate Appropriate Shared Savings Incentive Dollar Value Needed To Realize Hurdle Rate

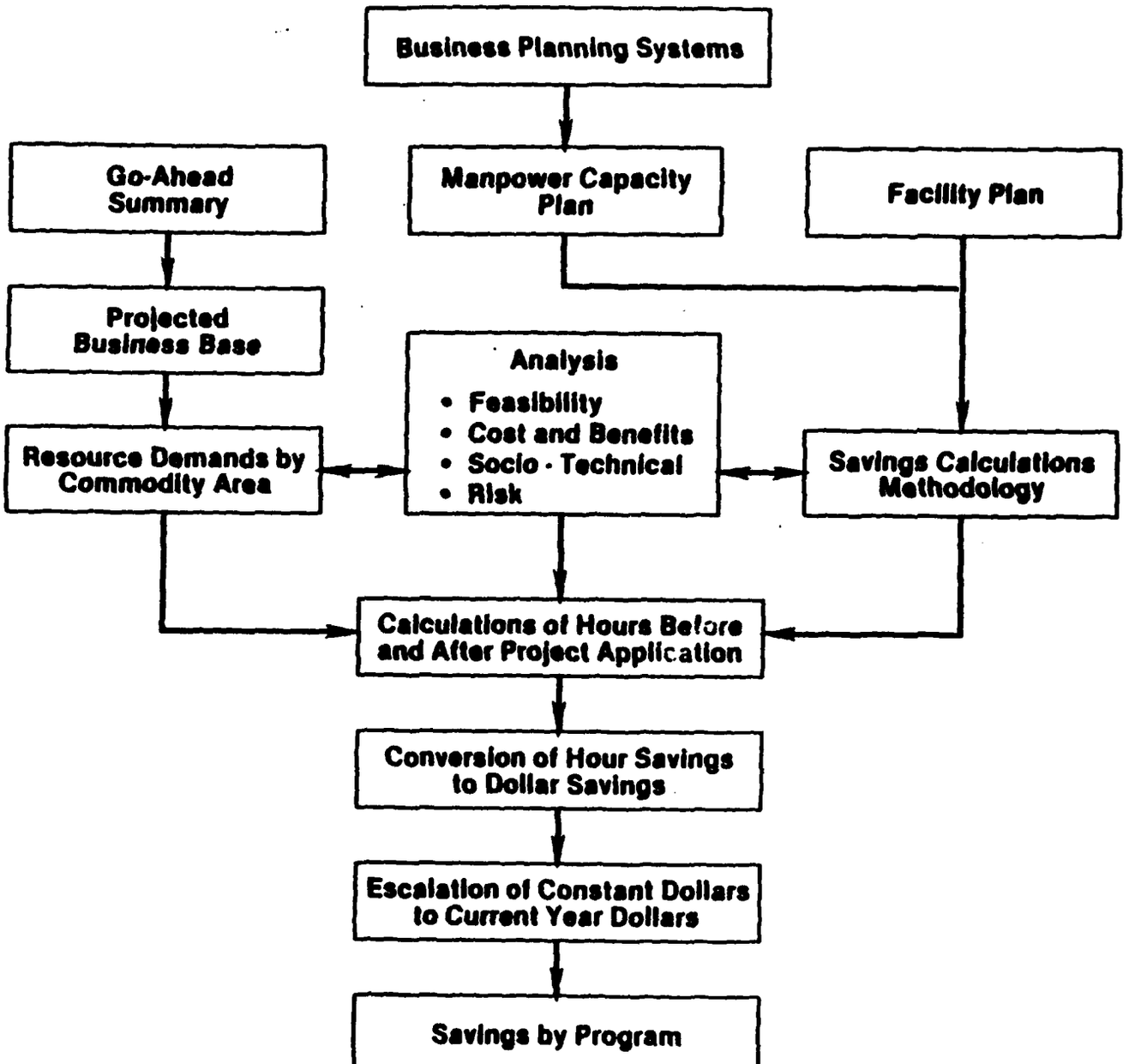
IDEFϕ Function Model





Cost/Benefits Analysis Methodology

Technology Modernization Project Evaluation

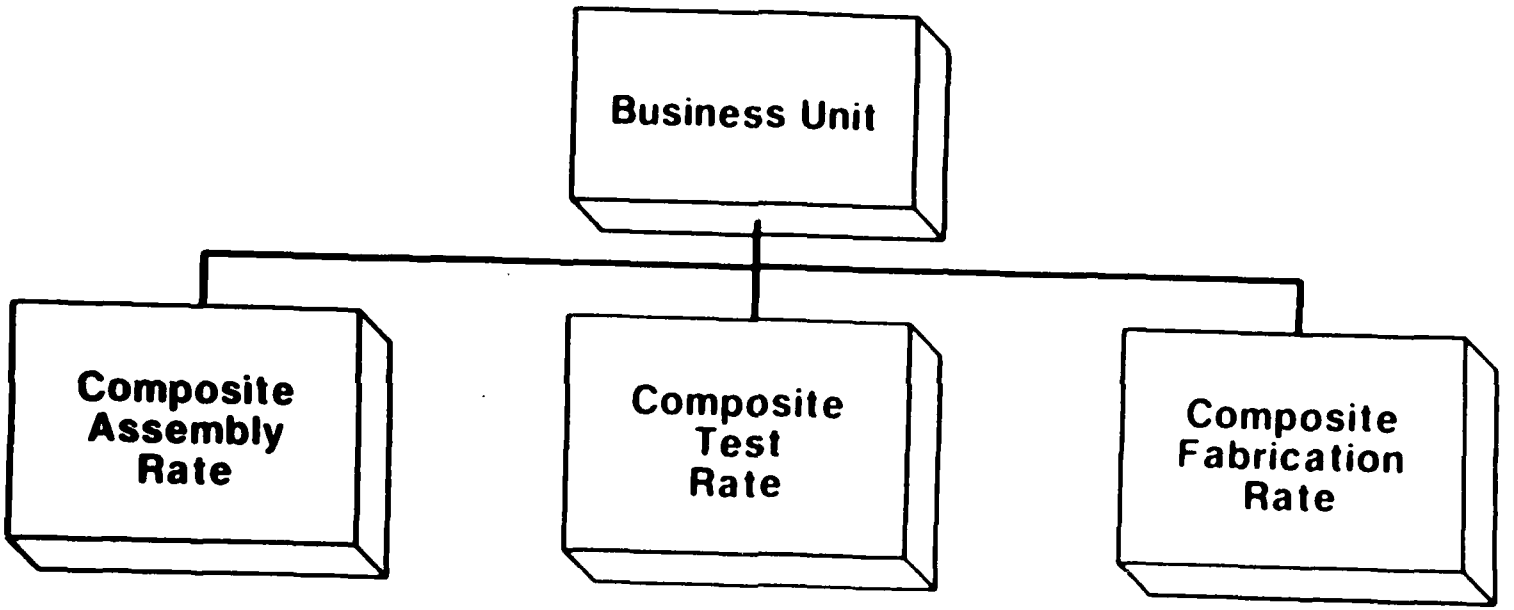


DoD Cost / Pricing Format (DD633)

1. Purchased Materials and Services
   - A. Purchased Parts
   - B. Subcontracted Items
   - C. Development Materials
2. Procurement Burden
3. Interdivisional Transfers
4. Engineering
   - A. Labor
   - B. Overhead
5. Factory
   - A. Labor
   - B. Overhead
6. Other Costs
   - A. Computer
   - B. Travel
   - C. Tooling
   - D. Miscellaneous

Aggregate Costing Rates

Sample Business Unit Rates Breakdown



- Simple
- Average
- Complex

- Simple
- Average
- Complex

- Simple
- Average
- Complex

Aggregate Costing Rates

- Direct Labor
- Departmental Overhead
- Allocations

Aggregate Costing Rates

- Direct Labor
  - Wage Rate
  - Holiday / Vacation
  - Benefits

Aggregate Costing Rates

- **Departmental Overhead**
  - Meetings / Training / Travel
  - Supervision / Administration
  - Support
  - Equipment Depreciation
  - Utilities
  - Maintenance
  - Space
  - Expendables
  - Miscellaneous

Aggregate Costing Rates

- **Allocations**
  - Management Administration
  - Materials
  - Technical
  - Product Assurance
  - Computer
  - Finance
  - Miscellaneous

ATTACHMENT A - LMI SAMPLE DCF MODEL

DISCOUNTED CASH FLOW MODEL (Version 1.00)

		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	--- TOTALS
Years		1	2	3	4	5	6	7	8	9	10	--- 10
SECTION I. CORE DATA												
1 Contractor Investment		0.0	2,000.0	5,000.0	4,000.0	1,000.0	0.0	0.0	0.0	0.0	0.0	---12,000.0
Cumulative Total		0.0	2,000.0	7,000.0	11,000.0	12,000.0	12,000.0	12,000.0	12,000.0	12,000.0	12,000.0	---
2 Contractor Expenses		750.0	3,750.0	2,500.0	2,500.0	500.0	0.0	0.0	0.0	0.0	0.0	---10,000.0
Cumulative Total		750.0	4,500.0	7,000.0	9,500.0	10,000.0	10,000.0	10,000.0	10,000.0	10,000.0	10,000.0	---
3 DoD/Government Funding		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--- 0.0
Cumulative Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---
4 Savings Available to DoD		0.0	250.0	5,000.0	5,250.0	5,500.0	10,000.0	10,500.0	12,000.0	12,500.0	15,000.0	---76,000.0
Cumulative Total		0.0	250.0	5,250.0	10,500.0	16,000.0	26,000.0	36,500.0	48,500.0	61,000.0	76,000.0	---
												---
SECTION II. INCREMENTAL CASH FLOWS												
5 Productivity Savings Reward		0.0	75.0	2,250.0	2,500.0	2,500.0	1,875.0	0.0	0.0	0.0	0.0	--- 9,200.0
Cumulative Total		0.0	75.0	2,325.0	4,825.0	7,325.0	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0	---
6 Cost of Money (CAS 414)	10.38%	0.0	90.8	393.5	745.7	858.9	752.2	596.6	440.9	283.3	102.7	--- 4,385.6
7 CAS 409 Depreciation		0.0	250.0	875.0	1,375.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,250.0	---11,250.0
8 Profit Effect		712.1	3,629.9	2,333.1	2,187.2	332.7	(112.6)	(410.0)	(530.0)	(600.0)	(737.0)	--- 7,304.2
9 Subtotals: DoD Cash Flows to Contractor		712.1	4,045.7	4,955.6	6,807.9	5,308.6	4,014.6	1,685.8	1,410.1	1,184.3	614.9	---30,939.8
10 Salvage Value		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--- 0.0
11 Contractor Before-Tax Cash Flow		(37.9)	(1,704.3)	(1,444.4)	307.9	3,808.6	4,014.6	1,685.8	1,410.1	1,184.3	614.9	--- 9,939.8

SECTION III. TAX CALCULATIONS												
12 ACRS Depreciation		0.0	100.0	800.0	1,620.0	1,700.0	1,760.0	1,520.0	1,200.0	1,040.0	800.0	---10,980.0
13 Contractor Taxable Income		(37.9)	315.7	2,675.6	2,687.9	2,908.6	2,254.6	165.8	130.1	144.3	(185.1)	---10,979.8
14 Contractor Income Tax	46%	(17.4)	(53.2)	(1,230.8)	(1,236.0)	(1,337.9)	(1,037.1)	(76.3)	(59.9)	(66.4)	66.8	---(5,050.7)
15 Investment Tax Credit	8%	0.0	160.0	400.0	320.0	80.0	0.0	0.0	0.0	0.0	0.0	--- 960.0
16 Contractor After-Tax Cash Flow		(20.5)	(1,997.5)	(2,273.2)	(608.9)	2,593.9	2,977.5	1,609.5	1,350.3	1,118.0	721.6	--- 5,869.1
Cumulative Total		(20.5)	(1,618.0)	(3,893.1)	(4,501.7)	(1,907.8)	1,069.7	2,679.2	4,029.4	5,147.5	5,869.1	--- 20.561

SECTION IV. SUMMARY												
17 DoD Program Benefit (Without Incentive)		0.0	250.0	5,000.0	5,250.0	5,500.0	10,000.0	10,500.0	12,000.0	12,500.0	15,000.0	---76,000.0
Cumulative Total	76000	0.0	250.0	5,250.0	10,500.0	16,000.0	26,000.0	36,500.0	48,500.0	61,000.0	76,000.0	---
18 DoD Program Benefit (With Incentive)		0.0	175.0	2,750.0	2,750.0	3,000.0	8,125.0	10,500.0	12,000.0	12,500.0	15,000.0	---66,800.0
Cumulative Total	66800	0.0	175.0	2,925.0	5,675.0	8,675.0	16,800.0	27,300.0	39,300.0	51,800.0	66,800.0	---
19 DoD Payback Period	0.0 years											---
20 Government Benefit		(17.4)	68.2	3,580.8	3,446.4	4,296.8	9,162.1	10,576.3	12,039.9	12,566.5	14,933.2	---70,890.7
Cumulative Total		(17.4)	50.8	3,631.6	7,290.0	11,592.8	20,754.9	31,331.1	43,391.0	55,957.5	70,890.7	---
21 Government Payback Period	1.3 years											---
22 Contractor Internal Rate of Return												---
Without Incentive	3.0%											---
With Incentive	24.6%											---
21 Contractor Payback Period	5.6 years											

MODEL TH VERSION OF 10/18/85 13:07 -- 11 COLUMNS 50 VARIABLES

10/29/85

SAMPLE ROI ANALYSIS REPORT

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	TOTAL
EXPENSE	750.0	3750.0	2500.0	2500.0	500.0						10000.0
EQUIPMENT		2000.0	5000.0	4000.0	1000.0						12000.0
BUILDING											
CASH FLOW ADJ											
CAPITAL		2000.0	5000.0	4000.0	1000.0						12000.0
TOTAL INVESTMENT	750.0	5750.0	7500.0	6500.0	1500.0						22000.0
INCENTIVE SAVINGS		75.0	2250.0	2500.0	2500.0	1875.0					9200.0
DEPR RECOVERY		[illegible]	500.2	[illegible]	[illegible]	[illegible]	1410.0	1410.0	1410.0	1290.4	[illegible]
EXP RECOVERY	442.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
NET SAVINGS	42.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
SAVINGS LOSS		-75.0	-375.0	-675.0	-975.0	-1275.0	-1350.0	-1350.0	-1350.0	-1350.0	-8250.0
COST OF MONEY		91.4	399.2	755.8	871.7	788.8	633.1	487.6	341.3	201.1	4565.4
RETAINED SAVINGS			50.0	75.0	300.0	600.0	650.0	650.0	700.0	750.0	3775.0
IBT	42.3	412.3	2775.5	3093.1	3343.1	2513.1	283.1	-43.2	-259.5	-536.7	11569.3
IAT	22.8	222.4	[illegible]	[illegible]	[illegible]	[illegible]	126.5	-23.3	-140.1	-289.8	[illegible]
INVEST CREDIT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
ACC DEPR TAX ADJ		66.7	313.6	520.9	535.2	516.6	317.4	-165.6	-552.0	-597.3	955.5
EXPENSE TAX ADJ	36.9	168.4	42.0	69.8	-29.4	-10.8					276.8
NET CASH FLOW	-20.5	-1616.7	-2328.7	-550.8	2791.7	3296.6	1047.9	1221.1	717.9	411.3	5761.8
IRR	25.5										
COST SAVINGS		250.0	5000.0	5250.0	5500.0	10000.0	10500.0	12000.0	12500.0	15000.0	76000.0
CASH SAVINGS		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MAJOR PROC SAVINGS		150.0	4500.0	5000.0	5000.0	7500.0	9000.0	9500.0	10000.0	10500.0	61150.0

ATTACHMENT B ... SAMPLE DCF MODEL

VIII.A.5 - DCF/SSA

b. LTV Paper Test

DCF/LMI/WESTINGHOUSE PAPER TEST

LTV Aerospace and Defense
Vought Aero Products Division

Westinghouse model's cash flow analysis realistically follows the accounting/pricing methodology employed by defense contractors

LMI model's cash flow analysis has the following deficiencies:

- Does not recognize savings realized from commercial application of project technology
- Does not allow differing classes of depreciable capital investment
- Does not consider depreciation and expense as recoverable costs generating taxable income

LMI model is cumbersome requiring numerous side calculations outside the model; this deficiency is overcome in the Westinghouse model's performing many internal calculations that simplify user effort

Understandably Westinghouse rates and factors are utilized in their model's formulas; with some modification these rates and factors could become user data inputs

Westinghouse model has good flexibility with multiple year expenditure entries, asset classes and service lives

Model data requirements are compatible with test site data bases

DCF/LMI/WESTINGHOUSE PAPER TEST

Resource requirements are reasonable and output format provides good analysis visibility

Models provide good evaluative measures for manufacturing investment projects; rate of return and contractor's cash flow

Modification of the models for adaptation in a similar fashion to manufacturing efficiency projects could be accomplished by inclusion of evaluative measures such as the ratio of government cash flow to contractor cash flow

VIII.6 - Summary Remarks/Conclusion and Recommendations

a. Summary Remarks

Table V.-D.-1.-1. Generic Criteria Useful in Evaluating Productivity Management Methodologies (PMGC)

$PMGC_1$	• Does the methodology incorporate a 2-5 year strategic planning process?
$PMGC_2$	• Does the planning process, by which the 2-5 year plan is developed, substantively involve all major, relevant, and appropriate key decision makers in the organization?
$PMGC_3$	• Does the methodology recognize the need for a competent "champion"?
$PMGC_4$	• Does the methodology incorporate mechanisms for managing change within a political and sociological culture?
$PMGC_5$	• Does the methodology ensure that productivity basics are understood consistently by all persons in the organization?
$PMGC_6$	• Does the methodology consider and incorporate a process by which general awareness about the win-win features of productivity improvement can be developed? Does the methodology recognize that there are strong pressures/restraining forces impeding productivity improvement that must be forthrightly and openly dealt with?
$PMGC_7$	• Does the methodology incoporate the notion of stages of development or evolution for the productivity effort?
$PMGC_8$	• Is there genuine,, real, long-lasting top management support for the effort? Does the methodology provide a mechanism for getting and keeping the support?
$PMGC_9$	• Does the methodology adequately provide for integration of specific models, techniques, and steps within the methodology and a mechanism for integrating these with other management systems?
$PMGC_{10}$	• Does the methodology define how the productivity management plan will integrate with the business plan, marketing plan, capital budgeting plan, long-range (5-25 year) strategy plan, etc.?
$PMGC_{11}$	• Does the methodology utilize state-of-the-art participative management techniques, at all levels of management, to drive productivity improvement plans?

Table V.-D.-1.1. (cont.)

$PMGC_{12}$	• Does the methodology specifically deal with how to link strategic productivity improvement planning to action planning and effective implementation?
$PMGC_{13}$	• Does the methodology incorporate mechanisims that encourage and promote disciplined management of budgets (all resources) at various levels of management and supervision?
$PMGC_{14}$	• Does the methodology incorporate continuing and proactive development of improvement measurement and evaluation systems? Does the methodology specifically incoporate state-of-the-art productivity measurement and evaluation techniques?
$PMGC_{15}$	• Does the methodology strongly encourage periodic measurement and evaluation system audits that check to ensure that those things which truly constitute system performance are measured?
$PMGC_{16}$	• Does the methodology recognize the difference between measurement and evaluation systems for control purposes versus those for development and improvement purposes?
$PMGC_{17}$	• Does the methodology discourage measuring A while hoping for B?
$PMGC_{18}$	• Does the methodology define how various measurement and evaluation systems will integrate into a cohesive, effective management system that supports proactive productivity management?
$PMGC_{19}$	• Does the methodology allow for personalized scoreboard building by sections, work groups, departments, etc.?
$PMGC_{20}$	• Does the methodology promote continuing, proactive development of control and improvement techniques related to all resorces? Does the methodology specifically incorporate state-of-the-art productivity control and improvement approaches and techniques for labor, capital, energy, materials, and data/information?
$PMGC_{21}$	• Does the methodology encourage periodic audits of control and improvement procedures? Do we audit what we really reward?
$PMGC_{22}$	• Does the methodology discourage rewarding A while hoping for B?

Table V.-D.-1.-1. (cont.)

$PMGC_{23}$	• Does the methodology encourage and promote innovation at all levels of the organization?
$PMGC_{24}$	• Does the methodology utilize a "cost-driver" analysis to identify where improvement efforts are best directed?
$PMGC_{25}$	• Does the methodology define how to successfully link control and improvement to measurement and evaluation, and vice versa?
$PMGC_{26}$	• Does the methodology focus on building effective management systems as opposed to just automating? Are our improvement efforts piecemeal attempts to optimize subsystems at the expense of larger system performance?
$PMGC_{27}$	• Does the methodology strive to create goal-conguity/ win-win situations? If the organization wins, will the individual win also?
$PMGC_{28}$	• Does the methodology successfully utilize state-of-the-art participative management techniques for productivity improvement plan identification, development, and implementation?
$PMGC_{29}$	• Does the methodology focus on execution of management basics as an early step in productivity improvement?
$PMGC_{30}$	• Does the methodology hold management, staff, and employees accountable in a disciplined, consistent fashion?
$PMGC_{31}$	• Does the methodology incoporate planning for maintaining excellence once it is achieved?
$PMGC_{32}$	• Do all levels of management and staff understand the methodology? Does the methodology incoporate plans to involve management in its development and to continue education as to the methodologies execution?
$PMGC_{33}$	• Is the methodology designed so as to be self motivating?
$PMGC_{34}$	• Is the methodology as simple as possible?

Table V.-D.-1.-2. Generic Criteria Useful in Evaluating Productivity Measurement and Evaluation Models that will also Support Incentive methodology*
(PMEM GC)

$PMEMGC_1$	• Is the model easy to use? - Ease of Application
$PMEMGC_2$	• Ease of Application for Prime Contractors. • Ease of Application for Subcopntractors.
$PMEMGC_{3a}$	• Does model utilize existing company data bases? - Percent of data needed that is available.
$PMEMGC_{3b}$	• Does the model require developing new company data bases? If needed data is not available, can model be modified to provide valuable information? - New data bases that must be developed to use model.
$PMEMGC_{4a}$	• What does the model measure? (directly & indirectly) - Effectiveness - Efficiency - Quality - Productivity - Quality of Work Life - Innovation - Profitability
$PMEMGC_{4b}$	• Is the model primarily designed for: - cost/benefit, cash flow projection and analysis? - cost/benefit, cash flow tracking & validation? - productivity measurement & evaluation? - a control tool? - an improvement tool? - a department, function, or workgroup analysis tool? - a plant, division, or company analysis tool? - a project or program analysis tool?
$PMEMGC_5$	• Model usefulness for Manufacturing Efficiency Projects? for Manufacturing Investment Projects?
$PMEMGC_6$	• Implementation Costs? - general magnitude - design & development - implementation - operation and maintenance

* Incentive Methodology in this application infers Government to Contractor Incentive Systems such as IMIP.

Table V.-D.-1.-2. (cont.)

$PMEMGC_7$	• Ability to measure and allocate savings to multiple programs?
$PMEMGC_8$	• Ability to have productivity improvement projects and business programs added and deleted? Flexibility of model?
$PMEMGC_9$	• Ability to delineate commercial and government program benefits?
$PMEMGC_{10}$	• Quality of model output? Appropriateness of model output portrayal? Flexibility of output for variable audiences?
$PMEMGC_{11}$	• Accessibility of necessary input data? Preprocessing of input data required?
$PMEMGC_{12}$	• Auditability of model?
$PMEMGC_{13}$	• Ability of model to handle long cycle times, multiple products, frequent design changes, product mix changes?
$PMEMGC_{14}$	• Ease of translation and transfer of model within defense industry?
$PMEMGC_{15}$	• Perceived complexity of model?
$PMEMGC_{16}$	• Ability of model to satisfy needs of multiple users (i.e., Congress, DoD, contractor, managers, staff, etc.)?
$PMEMGC_{17}$	• Uniqueness and perceived utility of information provided by model?
$PMEMGC_{18}$	• Perceived implementation cost?
$PMEMGC_{19}$	• Ease of linkage, and quality of the link between what the model measures and incentive methodology?
$PMEMGC_{20}$	• Model's conformance to accepted cost accounting proactices?
$PMEMGC_{21}$	• Does the model follow functional (organizational chart) analysis or a cost-structured approach?
$PMEMGC_{22}$	• Model's allowance for comparing and contrasting "As Is and As Were" cost baselines vs. "To Be" cost baselines?

Table V.-D.-1.-2. (cont.)

$PMEMGC_{23}$	• Ability of model to incorporate uncertainty and risk?
$PMEMGC_{24}$	• Ability of model, using existing data, to track productivity improvement?
$PMEMGC_{25}$	• Ability of model to treat multi-dimensionality of performance and productivity, i.e., ability of model to examine cost factors and non-economic factors?
$PMEMGC_{26}$	• Ability of model to substantively involve users and people in the system in its development, evolution and use?
$PMEMGC_{27}$	• Ability of model to guide, direct, and even motivate action and implementation?
$PMEMGC_{28}$	• Ability of model to support decisions?
$PMEMGC_{29}$	• Ability of model to satisfy the goals of DoD and contractors?
$PMEMGC_{30}$	• Ability of model to be integrated successfully into typical defense industry management systems?

D. Comparison and Evaluation Methodology

2. Specific Criteria

CDEF: a) Has a functional structure been used?

b) Have function groups been identified?

c) Has the financial reporting structure been "mapped" against the functional structure?

d) Has a comprehensive Manufacturing Cost Model been identified?

e) Have Critical Success Factors and the related performance measures been identified?

f) Have "as is" and "to be" cost baselines been established?

g) Has project risk been considered?

h) Has the synergistic impact of the technology improvements been considered?

i) Has a benefits tracking plan been developed?

MFPM: Does the model:

a) provide an overall, integrated measure of productivity for a plant, division, firm, etc.?

b) provide an analytical mechanism for evaluating past performance?

c) provide important information for budget control?

d) provide constant value information on performance?

e) assess and evaluate bottom-line impact on profits from shifts in productivity and price-recovery?

f) track results of specific productivity improvement interventions or track total results of all productivity improvement interventions?

g) assist with establishment of productivity management planning?

h) provide in a succinct, integrated report containing information related to
   - changes in resource utilization and output composition.
   - traditional "pie chart," cost driver analysis data.
   - partial factor, multi-factor, and total productivity ratios.
   - performance indexes, changes in productivity, price-recovery and profits from period to period.
   - the constant-value dollar impact of productivity and price-recovery changes on profits.

i) provide management teams with the ability to forecast and simulate business conditions, cost patterns, productivity trends, and to analyze these changes (controlled, constrained or otherwise) on overall performance.

j) motivate more proactive productivity management efforts on part of management teams.

k) reflect good management system design (i.e., consider who is managing and what is being managed in relation to what we are managing with).

l) promote total factor (energy, capital, labor, materials, data/information) productivity management decision-making.

TABLE V.-E.-1.

	MFPMM	CDEF	DCF(LMI)
1 Ease of Use	Moderate	Moderate	Moderate
2 Ease of Use: Primes			
Ease of Use: Subs			
3a Data Availability	Good at Macro Analysis	Usually not available	Good, but requires estimation
3b Data Base Development	Not necessary for LTV type application	Necessary	Necessary in some areas
4a Measure: Effec.	Not Directly	Not Directly	Indirectly
Effic.	Indirectly	Yes (costs)	Projects
Qual.	Indirectly	No	Not Directly
Prod.	Directly	No	No
QWL	No	No	No
Innov.	Very Indirectly	Impact of Mftg.Improve.	Projects Impact
Prof.	Directly	Yes (costs)	Yes
4b Focus: CBA		X	X
CBT		X	
PM&E	X		
Control	X	X	
Improvement			
Group/Fnt.		X	
Plant/Firm	X	X	X
Project/Program		X	
5 Useful for: MEP	X	Not Intended Focus	Not Intended Focus
MIP	X	X	X
6 Implementation Costs			
• General Mag.	Mod	Hi	Lo
Design & Devel.	Mod	Hi	Lo
Implement.	Lo	Lo	Lo
Optns & Maint.	Lo	Lo	Lo
7 Meas. & Allocate Savings to Mult. Programs			
8 Flexibility	Good in LTV Type Applic.	Good once sys. set up	Good
9 Commercial vs. Government	Depends on data avail.	?	?
10 Output Quality	Needs Improvement	Needs Improvement	Needs Improvement

TABLE V.-E.-1.

	MFPMM	CDEF	DCF(LMI)
11 Access of Input Data	Good in LTV-type Applic.	Needs to be Developed	Estimation & Base Line Data
12 Auditability Primes	Good	Good	?
13 Appropriateness in Typica Defense Setting	Requires Modification	At program level is designed for this	Designed for Setting
14 Translation & Transfer	No Data	Situation specific	Apparent Problems
15 Perceived Complexityt	Hi	Hi	Hi
16 Satisfy Multiple Users	Feasible	Not Clear	Feasible
17 Utility of Info. Provided Uniqueness of Info Provided	Not Clear Hi	Not Clear Hi	To Govmt. Yes/Client? Mod-Lo
18 Perceived Implementation Cost	Hi	Hi	Mod
19 Link to Inc. Method.	Very Good	Not Sure/CBT	Very Good
20 Conform to Acctng.	Possible	Forced	Forced
21.Functional (org.chart) vs. Cost Structure	X LTV Applic. X Possible	X	X
22 "As Is" to "To Be" Comp.	Yes	Yes	Yes
23 Incorp. Uncert. & Risk	Yes	Yes	Not Clear/Possible
24 Track Prod. Imp.	Yes	CBT Data Avail.?	No
25 Multi Demensionality	Yes (Partial)	?	No
26 User Involvement	Not High in LTV Applic.	Lo	Lo
27 Motivate Improvement	Possible, not high in LTV Applic.	Weak	No
28 Support Decisions	Yes	Yes	Yes
29 Satisfy DoD? Contractors?	Possible ?	Assume So ?	Yes ?
30 Integratable into Mgmt Systems	Yes	Yes	Assume there already

VIII.A.6 - Summary Remarks/Conclusions and Recommendations

b. Conclusions and Recommendations

General Recommendations and Conclusions

Overall conclusion:

Contractors need to institute, promote, and maintain a broad-scope productivity management methodology which would represent a "grand strategy" for their business unit(s).

Overall Conclusion Cont'd

A productivity management methodolgy should encompass the productivity elements of:

Planning
Measurement
Evaluation
Control
Improvement

LTV/VAPD has developed, instituted, promoted, and is maintaining such a methodology. (Development is a a continuing process).

Other Conclusions

- **Individually, none of the three "models" (or methodology as the case may be) can accomplish:**

  1) An integrated productivity management methodology, and

  2) All the performance improvement goals desired by the Government and contractors.

- **Collectively, the three models (or methodolgies) can be integrated into an effective productivity management methodology. Development work on each is still required.**

Other Conclusions Cont'd

- **The CDEF "model" performs well against objectives and criteria for which it was designed.**

  - **The node-tree activity structure (IDEF Analysis*) can differ significantly from a company's organizational/accounting structure, thus requiring significant effort to develop.**
  - **LTV has perceived the cost of implementing the complete CDEF methodology at VAPD to be high, relative to other approaches (e.g., develop separate cost center accounting for each MIP).**

  *** IMIP Guide 5000-XX.G requires that an IDEF-type analysis be performed.**

Other Conclusions Cont'd

- **The MFPMM must be modified to function in the defense industry environment.**

  - LTV/VAPD has made conversions to the MFPMM and has found the model useful.

  - Of the three models tested, only the MFPMM actually measures input-output productivity.*

  *** Possible exception, the DCF model is an aggregate, end-result profitability measure. (Capital investment input; Annual savings output).**

Other Conclusions Cont'd

- **The DCF/SSA model is primarily an analysis and decision-making tool for planning and forecasting purposes.**

  - **There are major deficiencies in the software developed by LMI for IMIP implementation purposes.**

  - **Also, there is an inadequate user's manual for the software.**

Other Conclusions Cont'd

- **IMIP guidelines are inadequate with reference to submitting/justifying manufacturing efficiency projects.**
- **The impact of an IMIP project on the aggregate rates used by a contractor for pricing purposes may not be clearly understood by either contractor or Government.**
- **The translation and transfer of productivity models and methodologies from one company to another may be difficult.**
- **A generic methodology for productivity management efforts within the defense industry needs to be further developed and communicated.**

Recommendations

Primary

- **Combine Phases IV and V into a single, eighteen month project which would:**

  1) Resolve specific developmental needs of the three models by a limited field test at LTV/VAPD.

  2) Complete the development of an integrated productivity management methodology.

Primary Recommendations Cont'd

3) Review and evaluate the models and the integrated methodology with other defense contractors in a workshop setting.

4) Develop an Implementation Guide for the integrated methodology.

Other Recommendations Cont'd

- **Investigate and define a more precise set of specifications required by DoD for cost-tracking purposes.**
- **Develop a comprehensive treatise on the impact of aggregate versus project-related cost accounting rates and factors on IMIP-related projects.**
- **DoD needs to expand the range of incentives to encompass a contractor's "total" productivity improvements.**

Other Recommendations

Note: The implementation of these are judged to be outside-the-scope of Phases IV and V.

- **Modify the LMI version of the DCF/SSA model software. Develop a more comprehensive user's manual.**
- **An Implementation Guide needs to be developed to fully describe the methodology and criteria requirements to use the DCF/SSA model for IMIP purposes.**
- **Develop a more definitive set of IMIP guidelines for submitting and justifying a manufacturing efficiency project (MEP).**

VIII.B. Final Report Briefing Materials

(Presented by VPC to Dr. John Mittino,
Deputy Assistant, Secretary of Defense)

The Study of Productivity Measurement and Incentive Methodology

Phase III

Final Report

Briefing

18 February 1986

OVERALL GOALS OF FIVE-PHASE PROJECT

Superordinate Goal: To Improve The Performance of Defense Contractors and Subcontractors

- **To identify and describe current productivity measurement practices in the defense contractor community.**
- **To identify and describe currently available productivity measurement techniques.**

OVERALL GOALS (Contd.)

- **To test, evaluate and develop (if necessary) specific productivity measurement models and methodologies at a field test site.**
- **To develop an Implementation Guide that would be useful to a broad spectrum of defense contractors relative to productivity management & measurement.**

OVERALL GOALS (Contd.)

- To validate (as well as possible) that the models and methodologies developed and presented in the Implementation Guide are useful in a wide spectrum of defense contractor settings.
- To ensure that models and methodologies developed and described link to incentive methodologies.

Phase I

Title:

Contractor Survey of Productivity Measurement Practices

Principals:

Army Procurement Research Office

Goals:

To identify and describe current productivity measurement practices in the defense community.

To develop specific definitions of contractor productivity appropriate for the products concerned and contracts involved.

Phase I (Contd.)

Activities:

Design and distribute a survey to defense contractors.

Analyze survey responses.

Visit selected contractors for more detailed follow-up.

Results:

Survey completed.

Recommendation to test selected models.

Description of state-of-the-art practice for productivity measurement in defense contractor industry.

Phase II

Title:

Development of a Taxonomy of Productivity Measurement Theories and Techniques.

Principals:

D. Scott Sink
Thomas C. Tuttle

Goals:

To identify and describe state-of-the-art productivity measurement techniques and theories, and those being practiced.

To develop a taxonomy for those theories and techniques.

Phase II (Contd.)

Activities:

Detailed literature search.

Selected contractor site visits.

Development of taxonomy.

Results:

Comprehensive document describing productivity measurement theories and techniques.

Recommendation of which models to test in phases III and IV.

PROJECT STAFFING

P.I.:	D.SCOTT SINK, Ph.D.,P.E. DIRECTOR, VPC	(MFPMM TEST AND ANALYSIS COORDINATOR)
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FIELD SITE COORDINATOR:	MR.SHONI DHIR LTV/VOUGHT AEROSPACE	
CBA/TS TEST AND ANALYSIS COORDINATOR:	MS.BETTY THAYER PRICE WATERHOUSE	
IMIP/DCF/SSA TEST AND ANALYSIS COORDINATOR:	MR. RICHARD ENGWALL WESTINGHOUSE MANUFACTURING SYSTEMS AND TECHNOLOGY CENTER	
OVERALL PROJECT SUPPORT:	DR. THOMAS C. TUTTLE DIRECTOR, MCPQWL	

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MR. HAROLD GORDON, BELL HELICOPTER

PHASE III

GOAL -- TO EXECUTE A "PAPER TEST" OF THE THREE MODELS AND EVALUATE MODEL APPLICATIONS AT A FIELD SITE

OBJECTIVES --

01 -- EVALUATE EASE OF MEASURING AND EVALUATING PRODUCTIVITY (PERFORMANCE) WITH THESE THREE MODELS.

02 -- DEVELOP COMPREHENSIVE DESCRIPTION OF INPUTS AND OUTPUTS FOR EACH MODEL.

03 -- COMPARE, CONTRAST RESULTS OF PAPER TEST FOR THREE MODELS

04 -- IDENTIFY AND DESCRIBE IN DETAIL DATA REQUIRED TO DRIVE EACH MODEL.

05 -- DESCRIBE UNIT OF ANALYSIS (ie. APPLICATION) FOR EACH MODEL IN THE PAPER TEST. DESCRIBE MOST APPROPRIATE APPLICATION.

PHASE III

OBJECTIVES CONTINUED --

06 -- EVALUATE ABILITIES OF THE MODELS.

07 -- DESCRIBE INCENTIVE/REWARD SYSTEMS IN USE AT FIELD TEST SITE.

08 -- RECOMMEND MODIFICATIONS TO MODELS FOR MORE EFFECTIVE APPLICATION.

09 -- ADVISE AS TO WHETHER PHASE IV IS WORTHWHILE.

VI.B. General Recommendations and Conclusions

Overall conclusion:

Contractors need to institute, promote, and maintain a broad-scope productivity management methodology which would represent a "grand strategy" for their business unit(s).

Overall Conclusion Cont'd

A productivity management methodolgy should encompass the productivity elements of:

Planning
Measurement
Evaluation
Control
Improvement

LTV/VAPD has developed, instituted, promoted, and is maintaining such a methodology. (Development is a a continuing process).

Other Conclusions

- **Individually, none of the three "models" (or methodology as the case may be) can accomplish:**

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- **Collectively, the three models (or methodolgies) can be integrated into an effective productivity management methodology. Development work on each is still required.**

Other Conclusions Cont'd

- The CDEF "model" performs well against objectives and criteria for which it was designed.

  - The node-tree activity structure (IDEF Analysis*) can differ significantly from a company's organizational/accounting structure, thus requiring significant effort to develop.
  - LTV has perceived the cost of implementing the complete CDEF methodology at VAPD to be high, relative to other approaches (e.g., develop separate cost center accounting for each MIP).

  * IMIP Guide 5000-XX.G requires that an IDEF-type analysis be performed.

Other Conclusions Cont'd

- **The DCF/SSA model is primarily an analysis and decision-making tool for planning and forecasting purposes.**

  - **There are major deficiencies in the software developed by LMI for IMIP implementation purposes.**

  - **Also, there is an inadequate user's manual for the software.**

Other Conclusions Cont'd

- **The MFPMM must be modified to function in the defense industry environment.**

  - LTV/VAPD has made conversions to the MFPMM and has found the model useful.

  - Of the three models tested, only the MFPMM actually measures input-output productivity.*

  *** Possible exception, the DCF model is an aggregate, end-result profitability measure. (Capital investment input; Annual savings output).**

Other Conclusions Cont'd

- IMIP guidelines are inadequate with reference to submitting/justifying manufacturing efficiency projects.
- The impact of an IMIP project on the aggregate rates used by a contractor for pricing purposes may not be clearly understood by either contractor or Government.
- The translation and transfer of productivity models and methodologies from one company to another may be difficult.
- A generic methodology for productivity management efforts within the defense industry needs to be further developed and communicated.

FIGURE III-1
Generic Productivity Management Methodology
as Related to Defense Industry

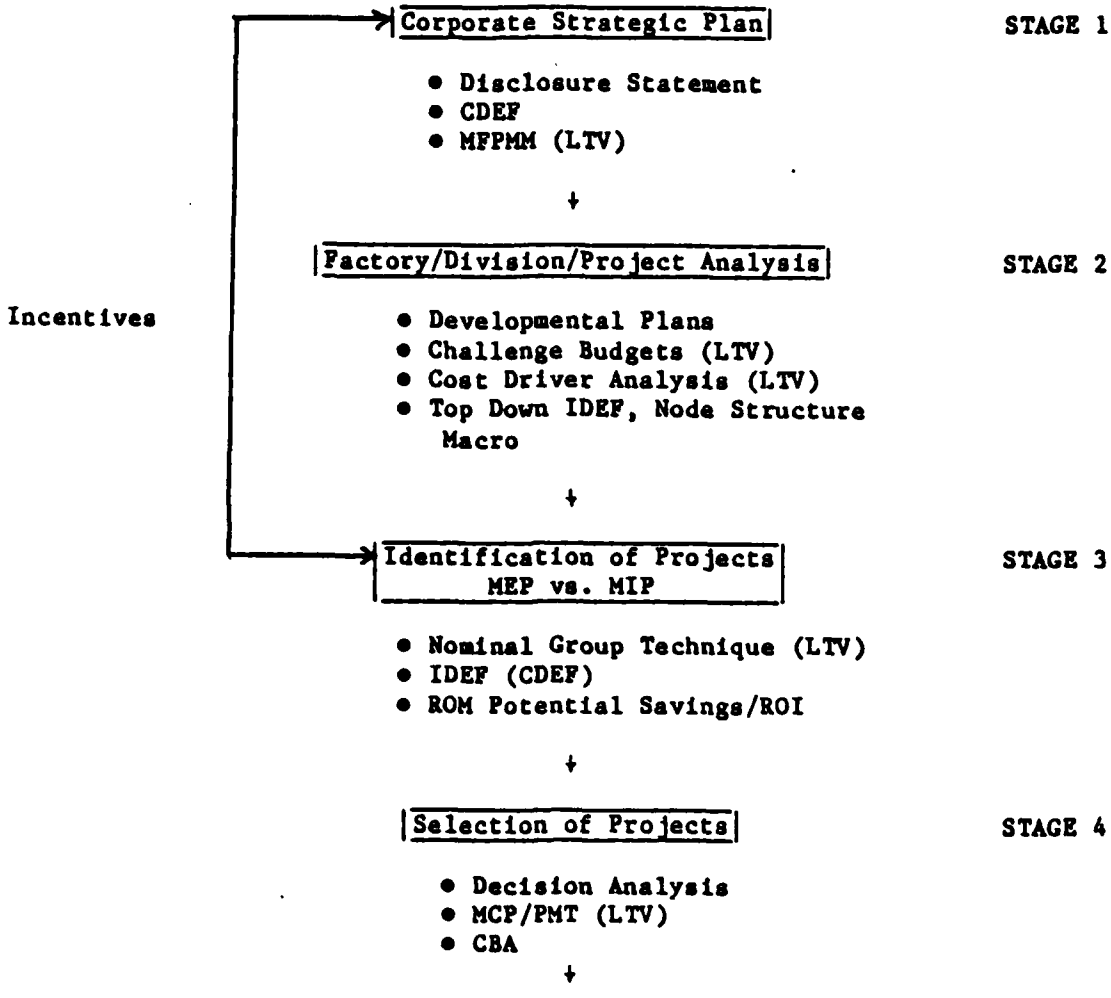


Figure III-1 (cont.)
Generic Productivity Management Methodology
As Related to Defense Industry

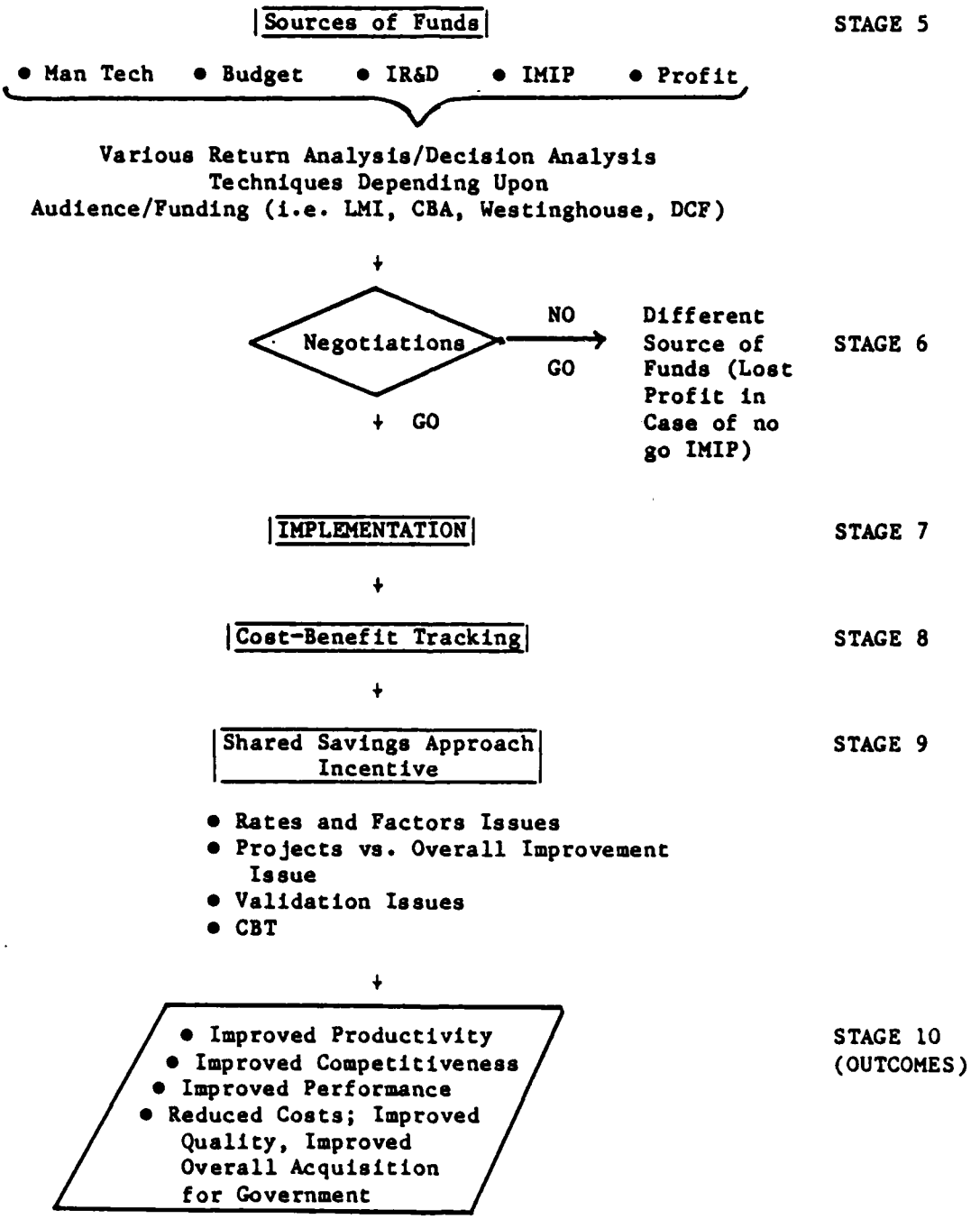
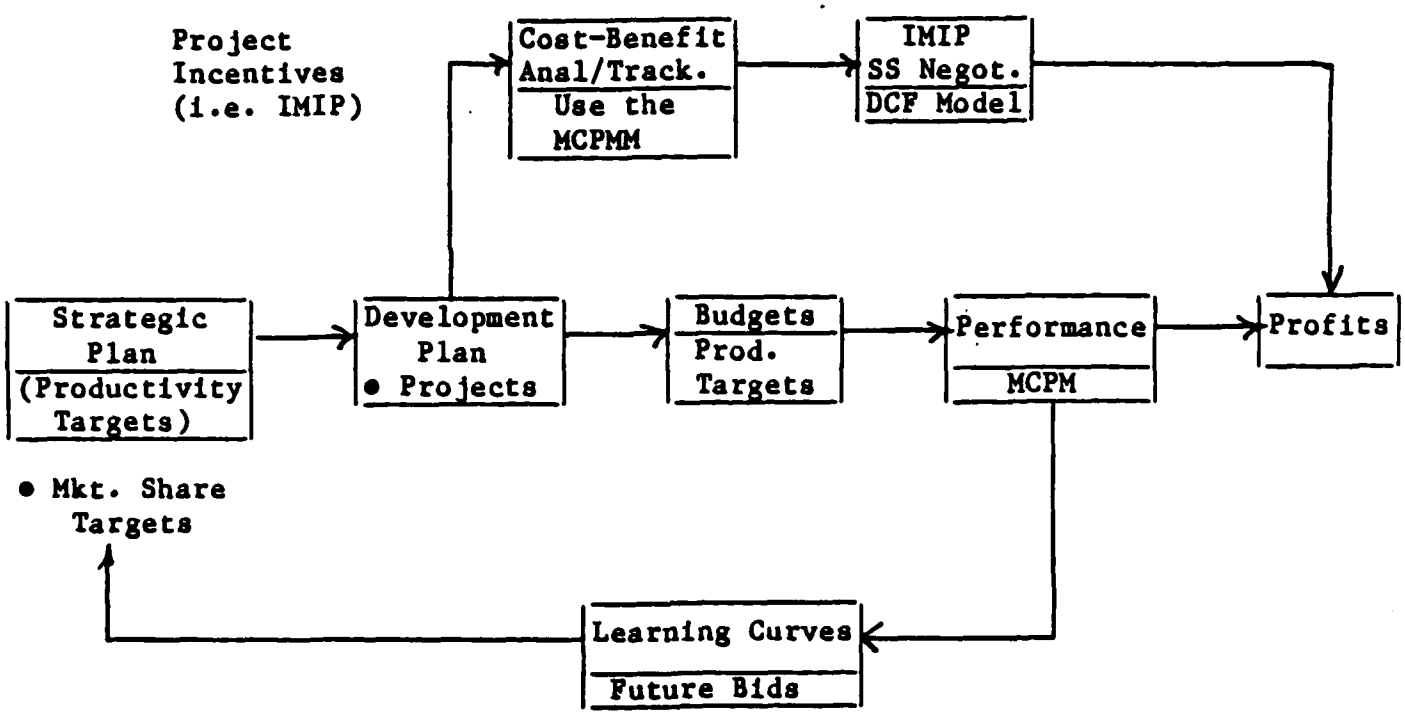


FIGURE III-2
Depiction of LTV/VAPD's Basic Approach
to Productivity Management



Comments:
- Process should be self-motivated
- IMIP utilized to minimize lost profit impact
- If there were overall total productivity improvement incentives the company would likely do what Government is after anyway and with less difficulty than by way of project focussed incentives.

Recommendations

Primary

- **Combine Phases IV and V into a single, eighteen month project which would:**

  1) Resolve specific developmental needs of the three models by a limited field test at LTV/VAPD.

  2) Complete the development of an integrated productivity management methodology.

Primary Recommendations Cont'd

3) Review and evaluate the models and the integrated methodology with other defense contractors in a workshop setting.

4) Develop an Implementation Guide for the integrated methodology.

Phase IV

Title:

The Study of Productivity Measurement and Incentive Methodology - Field Test

Participants:

D. Scott Sink, Principal Investigator, VPC
Marvin H. Agee, Investigator, VPC

Shoni Dhir, LTV/VAPD
Betty Thayer, Price Waterhouse
Thomas Tuttle, The Maryland Center for Productivity and Quality of Worklife

Other Recommendations Cont'd

- **Investigate and define a more precise set of specifications required by DoD for cost-tracking purposes.**
- **Develop a comprehensive treatise on the impact of aggregate versus project-related cost accounting rates and factors on IMIP-related projects.**
- **DoD needs to expand the range of incentives to encompass a contractor's "total" productivity improvements.**

Phase IV (Contd.)

Objectives:

Field test the MFPMM, CDEF, DCF/SSA, models and generic methodologies at LTV/VAPD

Develop a draft Implementation Guide

Implement at least three evaluation workshops with defense contractors (representative cross-section)

APPENDIX A

Distribution List

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